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CONTENTS

The Self-Psychology of the Psychoanalysts: MARY WHITON CALKINS AND ELEANOR A. MCC. GAMBLE, 277.

Cannon's Theory of Emotion: A Critique: EDWIN B. NEWMAN, F. THEODORE PERKINS, AND RAYMOND H. WHEELER, 305.

The Relation between Affectivity and Specific Processes in Sense-Organs: J. G. BEEBE-CENTER, 327.

The Criterion of Innate Behavior: D. G. MARQUIS, 334.

Cooperation or Conflict in the Study of Learning? PERCY HUGHES, 350.

Discussion:

Extinction and Negative Adaptation: GEORGE HUMPHREY, 361.

Note on 'The Analogy between Mental Images and Sparks': LEWIS F. RICHARDSON, 364.

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THE PSYCHOLOGICAL REVIEW

THE SELF-PSYCHOLOGY OF THE PSYCHOANALYSTS [1]

BY MARY WHITON CALKINS AND ELEANOR A. McC. GAMBLE
Wellesley College

The purpose of this paper is to show that the psychological doctrine of the psychoanalysts [2] is essentially personalistic. Psychoanalysis is a psychotherapeutic method rather than a psychological system. Its end and aim is to make patients clearly remember events which they have forgotten and to re-evaluate these events in the light of present experience. This method, none the less, presupposes a psychological theory—the doctrine, namely, that mental disturbance is due to the influence of urges or tendencies described as wholly, or in part, unconscious or as 'in the unconscious.' This theory, in the view of the writers of this paper, is a form of personalistic psychology, that is, of psychology conceived as science of the conscious being, or self, in relation to its environment, social and physical.

I. INTRODUCTION

i. Rough Definition of Psychoanalysis.—It is evidently necessary at the outset briefly to summarize the teachings of a personalistic psychology. The account which follows, though

[1] A paper read by the writers at the International Congress of Psychology in New Haven, September, 1929, briefly summarizes the arguments and conclusions of the present more elaborate discussion.

[2] The term 'psychoanalysts' is commonly used to refer not merely to Freud and his immediate disciples but also to Jung, Adler and other writers who have more or less derived their views from Freud. Despite the facts that Jung names his system 'analytical psychology' and that Adler describes his as 'individual psychology,' this paper, for convenience, throughout uses the term 'psychoanalytic' in the wider sense.

based by the writers primarily on their own form of self-psychology, embodies the essentials of the doctrines of William McDougall, Ward, Aveling, Stout, Müller-Freienfels, and William Stern, to name no others. By *self* is meant that, whatever it is, which the plain man means when he says "I am ashamed of myself;" "I am spurring myself on;" "you are the same old self." This self, whether regarded either as a 'self which has a body' or else as a 'conscious organism,'[3] has at least the following characters: first, it is identical in varying experiences and through succeeding moments[4]—for example, I, listening enchanted to Beethoven's Third Symphony, am in some sense the same self which as a child delighted in 'Annie Rooney' when ground out by a squeaky hand organ; and yet the self is, second, a changing self—for example, I no longer enjoy the squeaking hand organ which I nowadays hear. The self, in the third place, is a totality, a whole, a one; but, none the less, a whole of many characters and attitudes, a 'multiplex' self. The self, in the fourth place, is a unique, an individuated self, strictly speaking, irreplaceable by any other however like it: I am myself and you are you and he is he, however similar our history, our surroundings, our outlook, our experiences. Finally, as has already appeared, the self is related to its environment; and the relation, in its various forms, is what we know as consciousness.

ii. Brief Summary of Self-Psychology.—The detail of self-psychology is largely occupied with the analysis of consciousness in this sense of relation of self to environment. Self-psychology stresses certain basal attitudes of the self toward its objects. Of these, three groups are to be emphasized. One of them includes (*a*) activity, or desire in two forms, wish

[3] *Cf.* M. W. Calkins, Converging lines in contemporary psychology, *Brit. J. Psychol.* (Gen. Sect.), 1926, 16, pp. 174*ff*; and Is the self body or has it body?, *J. Phil.* 1908, 5, pp. 12*ff*.

[4] In our earlier accounts of the self we have used the term 'persistent' as synonym for 'identical.' I am now inclined to question this earlier usage, because 'persistent' is as properly, and perhaps more properly, used as synonym for 'enduring' or recurring and, thus used, is applicable rather to the experiences of a self. On the fact of these persistences and recurrences is based, it should be noted, the conception of the dispositions of the self. *Cf.* pp. 291–292 below. *M. W. C.*

or yearning, and volition; (*b*) the receptiveness distinctive of perception and emotion; (*c*) the feeling of being compelled. A second group of these basal attitudes comprises (*a*) the egocentric (or egoistic) attitude in which one stresses oneself at the expense of other self or of thing—the attitude evident, for example, in greed; and in sharp contrast with this, (*b*) the allocentric attitude in which one is absorbed in person or thing which is other than oneself—an attitude distinctive alike of perception with its impersonal objects and of emotions, such as reverence, which have essentially personal objects. These last-named attitudes, the egocentric and the allocentric, it is important to note, are often fused, as in vanity or shame —the happy or the unhappy awareness of oneself as approved or disapproved by other selves. And this double emphasis on oneself and on other selves may involve another, a participatory attitude, the core not only of what we know as emotional sympathy, compassion and *Mitfreude*, but of much at least of our perceptual experience. For precisely in that our perception is or may be felt as shared experience is it distinguished from imaginal sense-consciousness. A final group includes the generalizing and the individualizing personal attitudes; but on these no comment need be made.

Even so fragmentary a sketch of self-psychology must be supplemented by a word concerning its relation to the other forms of contemporary psychology. It is evidently a variety of introspective psychology and as such frankly opposed to behaviorism in the strict sense of that term. It looks on the behaviorist's *identification* of sensation, emotion or thought with bodily movement, as plain misstatement of the observed *correlation* between the two. But self-psychology is also at variance with what is sometimes called the orthodox form of introspective psychology. This is 'atomistic,' or 'structural' or 'existential' psychology, which sets out to study experiences as successive mental events regarded in independence of any self,—an impersonalistic form of introspective psychology which deals with sensations, percepts, images, emotions and volitions, in place of sensing, perceiving, imagining, feeling and willing selves. In vigorous opposition to this doctrine,

self-psychology insists that "thoughts and feelings do not occur when there is no Self for them to belong to." [5]

In each case that which personalistic psychology opposes is a negative attitude—the outlawry of the self from psychology. With the positive teaching alike of behaviorism and of event-psychology it has not the slightest quarrel: in fact, it incorporates these teachings. Thus on the one hand, like behaviorism, it studies a being (but a conscious being) reacting on an environment; and like impersonalistic introspective psychology, it makes use of analysis, experimental procedure, and physiological correlates.

A final word is needed to distinguish the psychologist's from the metaphysician's self. The relation is quite simply the following: the psychologist's is primarily the immediately observed self: whatever inferred characters—dispositions or tendencies, for instance—he attributes to it he frankly treats as explanatory constructs. The philosopher's self, on the other hand, is the personalistic psychologist's self supplemented by the characters, whatever they are, which the given metaphysician infers as essential to the self.

iii. Casual References to the Self in Psychoanalytic Writings. —Psychoanalysts make constant reference, under one name or another, to that which personalistic psychologists know as conscious self. Freud's pages, for example, are full of allusions to the ego as 'controlling,' 'fulfilling,' 'suffering' and the like whereas Adler often describes his system as *Persönlichkeitspsychologie.*[6] The critic may, to be sure, argue that such references are due purely to the conventions of language and are, therefore, inconclusive. But the careful reader finds clear evidence that psychoanalysts use the term 'conscious self' or 'ego' in the technical sense of the self-psychologist. For they attribute to this conscious ego important characters of the personalist's self. They stress, in the first place, the wholeness, the *Ganzheitlichkeit*, of any self, subject, or ego under discussion. So Adler, for example, declares that

[5] Quoted from Bertrand Russell (Scientific method in philosophy, Chicago, 1914, Lecture III, p. 75) who in this passage unambiguously appears in the unfamiliar role of a self-psychologist.

[6] Praxis und Theorie der Individualpsychologie, 3te Aufl., 1927, p. 4[5].

"single manifestations are only to be understood as partial aspects of an indivisible whole." [7] And (more ambiguously) Jung declares that the self (which in his view includes the conscious ego along with the unconscious psyche) is "subject of my totality." [8] The emphasis falls heavily also on the uniqueness or individuality of the self. Adler, indeed, calls his system '*individual-psychology*'; and Jung defines the individual as unique being and makes a "consciousness of its peculiar nature" essential to "the psychical individual." [9] Finally, all these writers conceive the self as related to its environment. "The psychic life," Adler unambiguously states, "is bound up with its environment—not isolated." [10] And Jung explicitly teaches that this "relatedness of psychic contents to the ego," this "function or activity which maintains the relation of psychic contents with the ego," is "consciousness." [11] It remains to add that these environing objects to which the self is related are, in the view of the psychoanalysts, social as well as physical.

II. The Psychoanalytic Theory of Mental Conflict

i. The Conflicting Units.—The preceding pages have reached the rather unimportant conclusion that psychoanalysts incidentally assert or imply the existence of the conscious self. The remainder of the paper is directed to a more significant end: it attempts to show that the distinctive doctrines of the psychoanalysts may and should be stated in personalistic terms. The main concern of psychoanalysts is with mental disturbance. Mental disturbance in the view of all psychoanalysts takes its rise in mental conflict or disharmony,[12]—in the conflict, for example, between a lover's desire for a woman already the wife of another and his im-

[7] Understanding human nature, transl. by W. B. Wolfe, p. 6. *Cf.* pp. 107^2, 189^2f. *Cf.* also Praxis und Theorie der Individualpsychologie, p. 1^3.

[8] Psychological types, p. $504.^4$ *Cf.* Die Beziehungen zwischen dem Ich und dem Unbewussten, p. 98^2.

[9] Psychological types, p. 560.

[10] Understanding human nature, p. 18^2.

[11] Psychological types, p. 535^3. The writers and most self-psychologists would substitute the term 'objects' for 'psychic contents.'

pulse to conform to social conventions or, to take another instance, in the conflict in a soldier's mind between his passionate wish for safety and his desire to prove himself a hero. In Jung's phrase: "The conflict . . . is the condition of every neurosis." [12]

Stripped of their figurative trappings, the accounts of mental conflict, which means mental disharmony, are of two main types. (*a*) Mental conflict, in the first place, is by most psychoanalysts said to occur between mental complexes. By complex is ordinarily meant a 'system of connected ideas' which is 'autonomous' [13]—which, in other words, leads "an independent existence . . . pursuing its own development." [14] From this point of view, as Hart puts it, 'a state of conflict' consists in two complexes trending in opposite and incompatible directions.[15] The conflict, for example, of the distracted lover is to be described as that between his sexual and his social complex. Obviously, this conception is incompatible with self-psychology. The personalistic psychologist must, in other words, reject this doctrine of the complex as autonomous mental process, for the reason so often reiterated, that every mental process, far from leading an independent existence, is directly observed to be process—that is, experience—of a conscious self. Yet the self-psychologist does not of necessity part company with the psychoanalyst in his conception of mental conflict. For (*b*) side by side, on the pages of the psychoanalysts with this atomistic doctrine of autonomous complexes contending with each other and of mental conflict as the onset of one bit of mind stuff on another external to it, is to be found a second, very different concept of mental conflict as struggle of the diversely wishing or diversely willing self with itself. The term 'complex' seems

[12] Psychology of the unconscious, p. 193 end. *Cf.* Adler, Praxis und Theorie der Individualpsychologie, p. 9[4]: "Unsere Untersuchung . . . erlaütert die Kampfstellung des Menschen insonderheit des Nervösen."

[13] This is also Jung's term. *Cf.* Die Beziehungen zwischen dem Ich und dem Unbewussten, pp. 184 *et al.*

[14] B. Hart, Psychology of insanity, pp. 61[2], 50[2], 42[1]. (Few psychologists agree with McDougall in restricting the term 'complex' to "that which is repressed." Outline of abnormal psychology, p. 227[1].)

[15] Hart, *op. cit.*, p. 78.

indeed sometimes to be used, as it certainly might be used, to designate not an autonomous mental process but a self-activity. In any case, whatever their use of the term 'complex,' psychoanalysts often conceive mental conflict in personal terms. So Adler describes it as *die Kampfstellung des Menschen;*[16] and Jung not merely refers to the 'duality of will' but expressly conceives conflict as that of one part of the soul with another;[17] while Hart says that 'the personality' regards the complex 'as belonging no longer to itself' but to 'some other . . . individual.'[18] Freud explicitly adopts this conception in his relatively recent study of the I (*das Ich*) as related both to the It (*das Es*) and also to the super-ego (*das Über-Ich*).[19] Though he regards the I as in part unconscious, Freud certainly conceives it in predominantly personalistic terms as 'a coherent organization of psychic events' on which 'consciousness depends,'[20] as perceiving the outer world and as initiating motions.[21] The I, thus described, relates itself in Freud's view, on the one hand, to an It or *Es*, a being described as unconscious yet passionate and impulsive;[22] on the other hand to a super-ego, an ego-ideal.[23] Freud's use of this doctrine, in place of the old metaphorical censor-conception to explain the facts of mental conflict and, in particular, of moral struggle brings into high relief its completely personalistic character. Remorse, Freud teaches, is awareness of tension (*Spannung*) between *Ich* and *Über-Ich;*[24] conscience is the *Ich's* subordination of itself to the Categorical Imperative of its *Über-Ich.*[25] The moral struggle he describes, on the one hand, as the ego's dominance

[16] Praxis und Theorie der Individualpsychologie, p. 94.

[17] Psychology of the unconscious, p. 194.

[18] Psychology of insanity, p. 118[2]. *Cf.* W. McDougall, referring to Hart: "Hart uses the word complex to denote every kind of habitual emotional attitude." (Outline of abnormal psychology, p. 231.)

[19] Das Ich und das Es, 1923.

[20] *Op. cit.*, pp. 14*f*. Taken out of its context the phrase 'a coherent organisation of psychic events' might be atomistically interpreted.

[21] *Op. cit.*, pp. 43[2], 69[1], 72[1].

[22] *Op. cit.*, p. 25[1]; pp. 27[2], 48[1].

[23] *Op. cit.*, pp. 31*ff*., 43[2], 64*ff*.

[24] Das Ich und das Es, 1923, p. 44[1].

[25] *Op. cit.*, p. 61[1].

(*Herrschung*) over instincts [26] and even more often as the conflict between two opposed attitudes, identification and resistance of the ego toward the super-ego. Obviously this is a wholly personalistic concept of mental conflict.[27]

The upshot of the preceding paragraphs is thus the following: The basal concept of psychotherapy, that of mental conflict, though often stated in the artificially constructed terms of atomistic psychology, is not only definable, but often actually defined by psychoanalysts, in personalistic terms. The succeeding pages must discuss in more detail the units of this conflict.

ii. The Basal Characters Attributed to the Conflicting Units. —To the units of the mental conflict, however conceived, whether impersonally or personally, psychoanalysts attribute the following basal characters: (*a*) Partial or total unconsciousness; (*b*) persistence or tendency to recurrence; (*c*) psychic energy. The two latter characters, as will later appear, are either readily or inevitably conceived in personalistic fashion. At first blush, however, the conception of the units of a mental conflict as unconscious seems wholly incompatible with personalistic theory. For the self-psychologist regards the mental as *ipso facto* conscious.

It is evident that if the writers are to make good the claim that psychoanalytic theory is a form of self-psychology, they must show that psychoanalysts might and should abandon their doctrine of the unconscious without yielding either their facts or their therapeutic method. The end proposed in the preceding sentence seems at first sight unattainable. For the doctrine of the unconscious is an invariable factor of psychoanalytic doctrine as of most forms of abnormal psychology. In Freud's phrase, it is 'the basal postulate of psychoanalysis' [28] and seems effectively to distinguish it from all forms of introspective psychology. The essential purpose of the following pages is, accordingly, to analyze and criticize psycho-

[26] "Das Ich entwickelt sich von der Triebwahrnehmung zur Triebbeherrschung," (Das Ich und das Es, p. 72^2).

[27] *Op. cit.*, pp. $40^3 f$, 60.

[28] Das Ich und Das Es, "Die Unterscheidung des Psychischen in Bewusstes und Unbewusstes ist die Grundvoraussetzung der Psychoanalyse." (p. 9^2.)

analytic concepts of the unconscious and to state and estimate the psychoanalytic argument for the existence of the unconscious.

The term 'argument' must here be taken in a Pickwickian sense. For psychoanalysts postulate and assume far more often than they argue their assertions, as the words just quoted from Freud very plainly indicate.[29] Yet despite the lack of overt demonstration, a thread of implicit argument runs through the psychoanalytic doctrine of the unconscious. Summarily stated, this argument runs somewhat as follows: (1) The mental and the physical are entirely independent of each other, therefore the mental must never be explained by any physiological process. (2) Many experiences, such as dreams and unwarranted emotions, cannot be completely explained by reference either to conscious self or to conscious process. (3) Since these experiences can be explained neither by the physiological nor by the conscious, they must be referred to the unconscious as their cause.

The writers of this paper undertake to criticize the second premise of this argument, ignoring the highly debatable assumption of its first premise. To make their position more concrete, they base the discussion on the following instance deliberately chosen in spite of its familiarity: Mr. X suffers from a form of agoraphobia; he will let no one occupy a chair behind his, or walk behind him; he is possessed by an overmastering fear lest some hostile person seize him from behind. For this pathological fear, he can give no explanation. When he is in his fifty-fifth year, however, X revisits his old home and a childhood experience is brought to light. As a little boy X was caught in the theft of a handful of nuts from a basket outside a grocer's shop by the grocer himself, who pounced upon him from the rear and horribly frightened him. Possessed of this natural explanation of his fear, X gradually loses his obsession.[30]

The essential features of this case reappear in many varieties of the situation which forms the basis of the psycho-

[29] For other passages in which Freud openly 'assumes,' without arguing, *cf.* Das Ich und das Es, pp. 19^3, 31^2, 40^2, 44^2, 54^3, 55^3, 71^2.

[30] *Cf.* E. Bagby, Etiology of phobias, *J. Abn. & Soc. Psychol.*, 1922, 17, p. 17.

analytic argument for the unconscious. A child's petty theft or disobedience, a woman's illicit sexual experience, the cowardly act or desire of a man in the trenches is wholly forgotten; none the less, it exerts an evident influence on the feeling and behavior of its forgetful perpetrator and furthermore it is in the end recalled. Evidently, therefore, the experience must still exist, not however, as conscious but as unconscious, or as in the unconscious. Or to state the argument in the concrete terms of our illustration, the experience of theft and of the threatening grocer did not belong to X, the conscious grown-up self, for he had forgotten it; yet this experience had not vanished, it was still existent, for it obviously influenced X's feeling and his conduct and was later recalled. Accordingly the theft experience must have existed in the unconscious.

Before proceeding to the criticism of this argument, the self-psychologist notes that the unconscious is inferred, not observed, in this explanation of the facts that an experience may be recalled though it has been wholly forgotten and that while forgotten it is continuously effective. Psychoanalysts frankly admit this. "What else," exclaims Freud, "could be back of these images and impulses . . . which have such great resistance to all the influences of an otherwise normal psychic life" except "unconscious psychological processes?" But he adds, "Let any one account for the facts of the disintegrated mind in a more correct scientific manner and we will gladly withdraw completely our assumption." [31]

The writers of this paper propose to take up the challenge which Freud so good-humoredly flings down. But before they put forward their personalistic account of the facts on which rests the psychoanalysts' argument, they will undertake a more radical criticism of the argument, pointing out that the bare conception of the unconscious is, on the one hand, hopelessly vague and, on the other hand, riddled with inconsistencies. The first point need not be specially stressed. For it is evident to every student of psychoanalytic literature that

[31] A general introduction to psychoanalysis, p. 240[2]. *Cf.* Das Ich und das Es, p. 10[2].

the unconscious is most vaguely, variously, confusedly and figuratively conceived. As a well-known expounder of the doctrine expressly admits: "The term is used very loosely in Freudian psychology." [32] Obviously no scientific psychologist can make serious use, as explanatory concept of the unconscious described as a 'realm' in which 'desires take refuge,' [33] as an engulfing sea, as the submerged part of an iceberg, or as a cavernous reservoir. Without its metaphorical trappings the unconscious appears in two quite distinct forms, each of two varieties—the four of them alternating quite indiscriminately in the writings of psychoanalysts: first, as literally unconscious state or process; second, as literally unconscious mind; third, as dissociated mental process; fourth, as dissociated self. The paragraphs which follow will set forth the inconsistencies involved in these conceptions.

(1) The first of these doctrines so largely figures on the pages of the psychoanalysts that it is unnecessary to illustrate it. By the personalistic psychologist the 'unconscious mental process' is of course rejected not only for its unconsciousness but for its claim to lead an existence independent of that of any self or person, whereas a process or state, it has been urged, is always and inevitably process or state of something or of somebody. Against the unconsciousness of the unconscious mental process, the self-psychologist makes common cause with all introspectionists. He argues, in brief, that the psychoanalyst's alleged unconscious processes are undistinguished, either by name or by description, from conscious mental processes. For confirmation of this assertion he appeals to the psychoanalytic texts which describe unconscious processes as memories or feelings, wishes or desires. But these are precisely the terms by which psychoanalysts, along with other psychologists, indicate conscious experiences. For them, as well as for the introspectionists, a memory is *in some cases* a remembering, a fear is a being afraid, and both remembering and being afraid are forms of consciousness.

[32] Beatrice Hinkle, in her Introduction to Jung's Psychology of the unconscious, p. xv[3]. Dr. Hinkle adds naïvely that the term " 'unconscious' . . . is not intended to provoke any academic discussion."

[33] Barbara Low, Outline of psychoanalysis, pp. 41, 52.

If then the psychoanalyst is to uphold the concept of unconscious mental processes he must show how an unconscious fear differs from a conscious fear, an unconscious memory from a conscious one. But this he never does. He claps the character of unconsciousness on what to start with is admittedly a phenomenon of consciousness, with no specific justification for this high-handed procedure, no discussion whatever of the distinctive nature of the supposed unconscious mental process.

(2) The critic turns accordingly to the second of the theories under discussion, that of literally unconscious mind, of which the unconscious mental process may be regarded as function or activity. By this conception, if seriously held, must be meant an entity, mental yet unconscious, closely related to, yet distinct from, the subject who once perceived and still is influenced by something which he has now forgotten though he may later recall it. This, the crucial fact of forgetting a continuously effective experience, is explained accordingly by the hypothesis that the experience lost to the conscious subject is still possessed or held by the affiliated unconscious mind which the theory postulates. But this conception, though it is widely held, certainly owes its popularity to the invincible tendency to substitute words for thoughts. For it is plainly incompatible with observed facts and disruptively inconsistent with itself. The criticism to be made upon it has, in substance, just been urged against the concept of the unconscious mental process. It runs as follows: Unconscious mind, in order to fulfill the purpose for which it is created—that is, inferred or assumed—must possess, or hold in itself, the experiences forgotten by the everyday self. But to possess memories without remembering, fears without being afraid, shame without being ashamed, is sheer impossibility. A memory *is* the experience of remembering, a fear *is* the experience of being afraid. The literally unconscious, accordingly, whether or not called mind, cannot be conceived as the shelter of abnormally forgotten experiences. The dilemma is indeed unavoidable. The unconscious if it were truly unconscious could not play the rôle for which it is cast, that is, it could not contain or hold the experiences which the

conscious ego had forgotten; on the other hand, the unconscious if it did contain or possess these forgotten experiences would be, despite its name, no longer an unconscious but rather conscious mind. This leads at once to the consideration of the third and fourth of the conceptions of the unconscious.

(3) Many passages in the writings of the psychoanalysts suggest that their authors refer by the term 'the unconscious' neither to literally unconscious mental process nor to literally unconscious mind but rather to dissociated process and to dissociated mind. The first-named conception, that of the dissociated mental process, assumes a sort of succession of mental happenings aside from the main 'stream of consciousness' and not open to everyday introspection. In the comment which follows, this form of dissociation-theory will be mainly disregarded on the ground that the conception of independent mental process, conscious or unconscious, has already been effectively criticized.

(4) This leaves the conception of unconscious mind as a dissociated or split-off personality influencing the everyday conscious ego, of which the everyday self is unaware.[34] In terms of our illustration, the unconscious who possessed the memory of the grocer experience during X's forgetfulness of it is X's secondary or split-off personality. Favoring this interpretation of the psychoanalysts' unconscious as virtually a dissociated or split-off personality, is the fact that all psychoanalytic writers, greatly as they differ in detail, attribute to the unconscious the basal characters which, as has already appeared, belong also to the conscious self. The unconscious, they teach, is, in the first place, a One or whole of many parts or members; as such, in the second place, it has a certain continuity, a relative permanence or persistence;[35] it is, in the third place, active, possessed of psychic energy, a

[34] *Cf.* W. McDougall, Outline of abnormal psychology, chap. XII, p. 234. "Many authorities write of 'dissociation of consciousness' . . . . It is better . . . to speak of dissociation of the personality."

[35] J. S. Moore teaches that the basal reason for postulating or inferring unconscious mind (the subconscious, as he calls it) is precisely the occurrence of phenomena, such as recognition, which involve 'personal continuity.' *Cf.* The foundations of psychology, pp. 192*ff*.

If then the psychoanalyst is to uphold the concept of unconscious mental processes he must show how an unconscious fear differs from a conscious fear, an unconscious memory from a conscious one. But this he never does. He claps the character of unconsciousness on what to start with is admittedly a phenomenon of consciousness, with no specific justification for this high-handed procedure, no discussion whatever of the distinctive nature of the supposed unconscious mental process.

(2) The critic turns accordingly to the second of the theories under discussion, that of literally unconscious mind, of which the unconscious mental process may be regarded as function or activity. By this conception, if seriously held, must be meant an entity, mental yet unconscious, closely related to, yet distinct from, the subject who once perceived and still is influenced by something which he has now forgotten though he may later recall it. This, the crucial fact of forgetting a continuously effective experience, is explained accordingly by the hypothesis that the experience lost to the conscious subject is still possessed or held by the affiliated unconscious mind which the theory postulates. But this conception, though it is widely held, certainly owes its popularity to the invincible tendency to substitute words for thoughts. For it is plainly incompatible with observed facts and disruptively inconsistent with itself. The criticism to be made upon it has, in substance, just been urged against the concept of the unconscious mental process. It runs as follows: Unconscious mind, in order to fulfill the purpose for which it is created—that is, inferred or assumed—must possess, or hold in itself, the experiences forgotten by the everyday self. But to possess memories without remembering, fears without being afraid, shame without being ashamed, is sheer impossibility. A memory *is* the experience of remembering, a fear *is* the experience of being afraid. The literally unconscious, accordingly, whether or not called mind, cannot be conceived as the shelter of abnormally forgotten experiences. The dilemma is indeed unavoidable. The unconscious if it were truly unconscious could not play the rôle for which it is cast, that is, it could not contain or hold the experiences which the

conscious ego had forgotten; on the other hand, the unconscious if it did contain or possess these forgotten experiences would be, despite its name, no longer an unconscious but rather conscious mind. This leads at once to the consideration of the third and fourth of the conceptions of the unconscious.

(3) Many passages in the writings of the psychoanalysts suggest that their authors refer by the term 'the unconscious' neither to literally unconscious mental process nor to literally unconscious mind but rather to dissociated process and to dissociated mind. The first-named conception, that of the dissociated mental process, assumes a sort of succession of mental happenings aside from the main 'stream of consciousness' and not open to everyday introspection. In the comment which follows, this form of dissociation-theory will be mainly disregarded on the ground that the conception of independent mental process, conscious or unconscious, has already been effectively criticized.

(4) This leaves the conception of unconscious mind as a dissociated or split-off personality influencing the everyday conscious ego, of which the everyday self is unaware.[34] In terms of our illustration, the unconscious who possessed the memory of the grocer experience during X's forgetfulness of it is X's secondary or split-off personality. Favoring this interpretation of the psychoanalysts' unconscious as virtually a dissociated or split-off personality, is the fact that all psychoanalytic writers, greatly as they differ in detail, attribute to the unconscious the basal characters which, as has already appeared, belong also to the conscious self. The unconscious, they teach, is, in the first place, a One or whole of many parts or members; as such, in the second place, it has a certain continuity, a relative permanence or persistence;[35] it is, in the third place, active, possessed of psychic energy, a

[34] *Cf.* W. McDougall, Outline of abnormal psychology, chap. XII, p. 234. "Many authorities write of 'dissociation of consciousness' . . . . It is better . . . to speak of dissociation of the personality."

[35] J. S. Moore teaches that the basal reason for postulating or inferring unconscious mind (the subconscious, as he calls it) is precisely the occurrence of phenomena, such as recognition, which involve 'personal continuity.' *Cf.* The foundations of psychology, pp. 192*ff*.

creature of desires, instincts, and urges; it is finally significantly related to the everyday self. Psychoanalysts, it is true, do not expressly describe the unconscious as a secondary personality. Indeed, they are sometimes at pains to deny the personality of the unconscious. So Jung expressly insists in his account of the *Mana-Persönlichkeit* that he does not conceive the unconscious as actually personal.[36] The denial, however, as the context indicates can mean no more than that the unconscious is not to be conceived as normal human person, for Jung expressly and repeatedly attributes specific forms of consciousness—wishing, desiring, and even volition—to his unconscious. He says unambiguously, "The unconscious is able not merely to wish but again to revoke its own wishes. . . . There are," he later asserts, "very many experiences which seem to prove that the unconscious cannot merely be spontaneous but can also appropriate to itself leadership." [37]

The main outcome of the preceding pages is the following: The argument by which psychoanalysts seek to show that the conflicting units of mental conflict are unconscious, or in the unconscious, is a defective argument for the decisive reason that both the conceptions of the literal unconscious are inconsistent and hence untenable. And yet the facts from which the argument proceeds are indisputable. At this point, accordingly, the self-psychologist comes forward with his own personalistic explanations of these incontrovertible facts. There are two such explanations. The first, which the preceding paragraph has already indicated, he shares with some of the psychoanalysts: it is the doctrine that the forgotten yet still effective experiences far from being unconscious are remembered and communicated by a split-off but co-conscious personality. The second, that of the authors of this paper, is in terms of normal psychology, and will be set forth more fully in what follows.

[36] Die Beziehung zwischen dem Ich und dem Unbewussten, p. 197 [1].

[37] *Op. cit.*, pp. 79, 110[1]: "Das Unbewusste kann nicht nur 'wünschen' sondern auch seine eigene Wünsche wieder aufheben. . . . Es giebt . . . sehr viele Erfahrungen die zu beweisen scheinen, dass das Unbewusste nicht nur spontan sein sondern sogar die Führung sich aneignen kann."

The two facts which the theory must account for, or at the least state, in personalistic terms should be held clearly in mind. These are: first, the seeming influence of a forgotten experience in the period in which it has vanished from the mind; second, the ultimate recall of this same experience. The self-psychologist refers the first of these facts to the observed sameness, or identity of the self, coupled with the varying duration, observed also and not inferred, of different types of the self's experiencing. (*a*) By sameness or identity of self is meant neither absolute immutability nor even immortality [38] but merely the self-identity observed in all recognition, assumed in all anticipation, and indicated by such expressions as: "It is hard to believe that I am actually standing on the porch of the Parthenon when, for all these years, I have so longed to see it."

(*b*) By 'the varying duration of the self's experiences' the self-psychologist refers to the diverse rates of change within the self. The self changes, that is, it is in many ways differently conscious at different times; but in other ways the self is enduringly conscious through long stretches of time. And the fact here stressed by the self-psychologist is that the self is more unchanging, more persistent, more conservative in its non-cognitive than in its cognitive experiences. To state this more concretely: our emotions, our self-assertions and our convictions outlive both the memories and the reasonings on which originally they may have been based. Long after we have satisfactorily proved to ourselves the unworthiness of a given person, we retain a sneaking prejudice in his favor; long after we have owned ourselves convinced by the argument for idealism, we remain, in feeling, dualists; long after we have branded the Republican party as hopelessly hidebound, we tingle to the call of the G. O. P. In a word, our feelings survive our conclusions and outlive our memories.

It remains to indicate in a word the self-psychologist's account of the second of the facts from which psychoanalysts

[38] This statement is intended not as a denial of immortality (a doctrine accepted by the writers in their capacity of philosophical thinkers) but as insistence that immortality must be regarded as an inferred, not an observed, character of the self.

argue to the unconscious. This is the fact of the ultimate recall of the pathologically forgotten experience. Here, the self-psychologist simply replaces the psychoanalyst's indefensible conception of the continued existence of forgotten experiences in the unconscious by the conception of the self's observed tendency to recall even the long-forgotten. By tendency (or likelihood) to recall, it must be remarked, can be meant no directly observed character—one cannot observe a likelihood—but a character inferred from actual experience. In fact no more need be meant than this: that as a matter of observation we do frequently recall what we have long forgotten. Yet this conception of tendency accords well with the observed self-identity of the self. To the writers of this paper it seems evident that the psychoanalytic doctrine of mental processes in the unconscious is an invalid and a metaphorical way of describing tendencies to recall.

To summarize the detail of the preceding page: The self-psychologist has either to explain or, barring explanation, to state in personalistic terms the facts (1) that mentally disturbed, and at times even normal, subjects are evidently and profoundly affected during a certain period by a past experience of which during that same period they are wholly unconscious; and (2) that they may subsequently recall this apparently quite forgotten experience. The self-psychologist's statement of these facts is the following: The disturbed self, he says, has been so strongly affected in the past by some crucial happening that the emotional part of its experience, thus roused, long outlasts its stimulus; whereas the less enduring cognitive part of the experience, in other words, the memory of the event, soon vanishes. And the ultimate recall of the forgotten situation through a specially vivid stimulus is simply an indication of the self's persisting tendency to recall. This is the conception which the writers of this paper wish to substitute for the vulnerable doctrine of the literal unconscious. They believe, furthermore, that this explanation by the variously enduring character of different factors of the experience of one and the same self better accounts for the apparently continuous influence of forgotten

events than does the psychoanalytic conception of a split-off personality (or of dissociated mental processes) distinct from the everyday self.

It is time to take account of stock. This paper is a study of psychoanalysis conceived as theory of mental conflict. The preceding pages have discussed one of the characters, unconsciousness, attributed by psychoanalysts to the units of a mental conflict. To re-state their conclusions in a reverse order: It has been shown that the unconscious, conceived as the dissociated, is not really unconscious; that the two conceptions of the literal unconscious are untenable; that the argument for the existence of a literal unconscious is indecisive; and finally that the facts on which this argument is based are explicable in terms of normal self-psychology. In a word, it has been shown that the psychoanalysts should (and sometimes do) abandon their doctrine of the literal unconscious without yielding any of their facts. It follows that one may not appeal to the doctrine of the unconscious to mark off psychoanalytic theory from self-psychology.

A few sentences will suffice for the discussion of the second brace of characters, persistence or recurrence, attributed by the psychoanalyst to the unit of a mental conflict. For the preceding section has shown that self-psychology is here in full agreement with psychoanalytic doctrine. Indeed, the personalistic explanation of pathological forgetfulness has proved to be in terms of the varying persistence, on the one hand, of affective or volitional and, on the other hand, of cognitive experiences. The point which self-psychology stresses is that the awareness of experiences as recurring really is the awareness of a self reliving its own experiences.

The useful conception to which later reference will be made, of personal tendencies or personal 'dispositions,' is of course based on this same character of self-identity. It should, however, again be noted that the dispositions, self-preservative, self-developing, social, and the like, are inferred, not directly observed. For, strictly speaking, by personal 'tendency' or 'disposition,' can be meant only the likelihood that a self will feel or act thus or thus; and a 'likelihood' is always inferred, after the outcome, not directly observed.

The self-psychologist has finally to show that the third of the basal characters, psychic energy, attributed by psychoanalysts to the conflicting units of mental disharmony, is fully describable in his own terms. At the outset the self-psychologist is likely to deprecate the tendency of psychoanalysts, as of many other psychologists, to regard psychic energy as in some sort a counterpart of physical energy. Jung, for example, says: "The conception of libido as developed in the new work of Freud and of his school has functionally the same significance in the biological territory as has the conception of energy since the time of Robert Mayer in the physical realm."[39] The first difficulty with this statement is its easy generality. As a matter of fact, psychic energy *is* neither mechanical, molecular, nor atomic; and it cannot claim to exemplify the conservation law, which is a generalization from physical experiments. A second objection, from the standpoint of the psychoanalyst, is that a sharp distinction between the psychical and the physiological is essential to the psychoanalytic argument for the existence of an unconscious.[40] And a final difficulty with the analogy between psychic and physical energy is the fact that the physicists themselves have the vaguest possible concept of energy as 'that which' is manifested in all phenomena, transformable from one mode to another, and incapable of being added to or diminished.[41] Since, then, the physicists so obviously do not know concretely what energy is, little if anything is gained by describing experience as possessed of psychic energy and going on to elucidate psychic energy as counterpart of physical. Accordingly the question has still to be urged: What, literally and concretely, is the psychic energy which permeates mental conflicts and is attributed to contending complexes.

To this question psychoanalysts offer two related yet distinct replies. (1) On the one hand, they either identify or

[39] Psychology of the unconscious, p. 138.

[40] It is for this reason perhaps that Jung, while pressing the analogy, refrains from making psychic energy identical with nerve energy.

[41] When physicists advance upon this bare concept of the 'that which' they always describe energy in such obviously mental terms as kinæsthetic sensation or volition.

ally psychic energy, which they call the libido, with yearning or wishing. Thus Freud describes the libido as a transferable (*verschiebbare*) energy which, "in itself indifferent, can supplement (*hinzutreten*) a qualitatively differentiated excitement (*Regung*), whether erotic or destructive, and heighten its totality (*Gesamtbesetzung*)." [42] Less ambiguously, Jung virtually identifies the libido (a psychic energy) with 'wish,' 'desire,' 'the will in the sense of Schopenhauer'—in other words with longing, yearning, instinctive and involuntary desire.[43] (2) Adler, on the other hand, conceives psychic energy as purposive struggle (*Zielstrebigkeit*),[44] the striving for an ultimate aim to which, in at least one passage, Adler ascribes creative, directive, and ordering force.[45]

Both these conceptions of psychic energy have the obvious advantage of abandoning the metaphorical appeal to the conceptions, in themselves so vague, of physical energy in favor of the direct scrutiny of the facts of mental conflict. And such direct observation does indeed, in the opinion of the writers, disclose the experience of mental disharmony as an opposition of longings, yearnings, wishings or else as a conflict of purposings or volitions. The mentally unreconciled, inharmonious self is one which, simultaneously or in swift alternation, yearns and longs or else purposes and wills in sharply opposed directions. In a word, 'mental energy' is just that distinctive and not further analyzable attitude of 'activity' which may be contrasted alike with the receptivity distinctive of emotion and with the feeling of being compelled.[46] And what marks off libido, or yearning, or wish—the Freudian kind of mental activity—is its lack of that assertiveness, what James calls the 'fiat,' which distinguishes volition in all its forms. I may wish or yearn, without expectation of

[42] Das Ich und das Es, 1923, pp. 54^3, 55^2.

[43] Psychology of the unconscious, pp. 136*f*, 96. It should be added that Jung sometimes seems to verge toward the second, the volitional concept of psychic energy, as when he speaks (*op. cit.*, p. 128) of "that driving strength of the soul which we call libido."

[44] Praxis und Theorie der Individualpsychologie, p. 4^4.

[45] Über den nervösen Charakter, p. 1^2. "Dieser Endzweck hat also eine bildende, richtunggebende, arrangierende Kraft."

[46] *Cf.* above, pp. 278–279.

achievement, but in my willing I am assertive, I dominate myself or another.[47]

The most important outcome of this study of these two concepts of 'psychic energy' was foretold at the outset: mental energy, whether conceived as libido or as purposive struggle, is naturally and indeed inevitably conceived not only as consciousness, experience, but also as form of personal experience. Yearning, longing, willing, whatever the factors into which they are analyzed, are experiencings of a self, not successive mental data. Yearning is some one's yearning; willing is somebody's deciding. In Adler's words, "Out of this determined, purposive struggle (*aus dieser selbstgesetzten Zielstrebigkeit*) there emerges" the unity of the personality.[48]

A further result of the analysis of Adler's concept of psychic energy is that he wrongly treats his doctrine of purposive striving as if incompatible with the libido conception.[49] On the other hand, the two concepts, (1) that of instinctive longing or 'drive' (*angeborene Triebkraft*) and (2) that of purposive striving (*Streben mit Endzweck*) are simply notions of two different forms of activity, or libido, the one that of the self as variously wishing, the other that of the diversely willing self; the one involving the instinctive yearnings and longings, the other the reflectively achieved purposiveness of the self. (It may indeed be questioned whether Adler does not tacitly include within his 'striving' not only purposive but involuntary desire. Thus, though he says expressly, "we are not in a position to think, to feel, to will, to act unless an aim beckons us on," he adds that the purpose (*das Endziel*) may be "conscious or unconscious.")[50]

[47] For a different view of the relation between volitional action and mental energy, *cf.* F. Aveling, Directing mental energy, pp. 190*ff.*

[48] Praxis und Theorie der Individualität, p. 4^4.

[49] *Cf.* Über den nervösen Charakter, pp. 12^2 *et al.*

[50] Praxis und Theorie der Individualpsychologie, pp. 2^5, 3^3. Equally untenable is Adler's distinction between the libido conception and the 'purposive striving' doctrine as respectively deterministic and indeterministic. Strictly speaking, the distinction is metaphysical and has no relevance for a psychological discussion. Since, however, it is stressed by theorists in both camps, it may profitably be noted that each of the two doctrines lends itself either to deterministic or to indeterministic treatment. To illustrate: one may conceive a narcissistic desire not as absolutely determining my decision but as freely chosen; and, on the other hand, one may conceive a given purpose not only as a free choice, but also as itself absolutely determined.

A final consideration is the following: From the analysis earlier undertaken of mental activity it follows that the conception of 'power,' that is, *effective* mental energy, should be distinguished from that of mere urge or drive. Each is a form of 'activity' but only volition, not mere wish, includes (whether validly or invalidly matters not to the psychologist) the direct awareness of power to achieve, a complex experience involving awareness of the dependence of future event on oneself.

From the consideration of these side-issues it is, however, time to return to the main line of argument. And it is wholly unnecessary to harbor the conclusion that psychoanalysts conceive the libido in consistently personalistic terms.

iii. Specific Characters of the Conflicting Units.—In pursuit of its main purpose, to show the personalistic character of doctrine underlying psychoanalysis, this paper has argued that mental conflict, the object of psychoanalytic study, is a personal experience, and is overtly or tacitly conceived as such by psychoanalysts themselves. In particular, it has shown that persistence and energy, two of the basal characters of the conflicting self-activities, are personal. This is, however, a very general conclusion and leaves definite questions unanswered. Not all desires are inharmonious. What, then, according to the psychoanalysts, are the specific, persisting activities of a self which conflict with each other? By what actual clashing purposes are conflicts to be explained? Psychoanalysts are distinguished among themselves by their answers to these questions. Jung's distinctive emphasis, as is well known, falls on the disharmony between the introverting or 'subjective' and the extroverting or 'objective' movement of the mind toward the real. "A part of the soul," he writes, "desires the outer object, another part harks back to the subjective world, where the airy and fragile palaces of fantasy beckon." Extroversion he defines as an "outward turning of the libido in the sense of a positive moving of subjective interest to the object . . . a manifest relatedness of subject to object" [51] and introversion similarly as "a turning

[51] Psychological types, transl. by H. G. Baynes, 1926, p. 542.

inwards of the libido whereby a negative relation of subject to object is expressed." [52] Obviously, this conception of a two-fold relation of subject to object, a relation in which now the subject and again the object is accentuated, belongs to self-psychology, that is, to the study of self as related to its objects. And Jung's classification of extroversion and of introversion as either "active, when deliberately willed," or "passive, when the object compels it," follows precisely the lines of personalistic psychology.[53]

For Adler, the source of mental disharmony is the feeling of weakness, impotence, inferiority to one's environment, which, inevitable in infancy and in childhood, may dog a man through life.[54] The initial disharmony, or opposition, is that between this inferiority feeling and the subject's "will to power." [55] And a second major conflict, distinctive of the moral life, is that between the agressive will to power and what Adler calls social feeling, by which he seems to refer not to kindly feeling and sympathy only but to assertive social activity as well.[56]

It would be irrelevant to the main purpose of this paper to discuss these distinctions in detail—to make, for example, a careful comparison of the terms 'will to power,' 'heightening of the personality-feeling' (*Erhöherung des Persönlichkeitsgefühls*),[57] and 'will to superiority,' [58] which Adler uses as virtual synonyms; or to comment on his uncritical use of the term 'social feeling' to include both emotional and volitional consciousness. But it is perfectly evident that all these experiences, feeling of inferiority, will to power or to superiority, and 'social feeling' are personal experiences. For, as Adler explicitly points out, the awareness of oneself as inferior

[52] *Op. cit.*, p. 567.

[53] *Op. cit.*, pp. 543, 567. *Cf.* p. 279 above.

[54] Über den nervösen Charakter, dritte Aufl. 1922, pp. VI[6], 15[2]; Praxis und Theorie der Individualpsychologie, p. 9[4]; Understanding human nature, pp. 70*ff.*

[55] Über den nervösen Charakter, pp. 20[3], 42[2]; Praxis und Theorie der Individualpsychologie, pp. 5*f*; Understanding human nature, pp. 33*f.*, 179, 285.

[56] Über den nervösen Charakter, p. 210; Praxis und Theorie der Individualpsychologie, pp. 10[2] *et al;* Understanding human nature, pp. 42*f.*, 120[1], 166[1], 285[6].

[57] Über den nervösen Charakter, pp. 21 *et al.*

[58] Praxis und Theorie der Individualpsychologie, pp. 5[3] *et al.*

or superior involves the comparison of oneself with other selves—with father or mother, brothers and sisters, playmates, fellow-students;[59] and both dominating will and the experiences grouped under 'social feeling' are impossible of description in terms of momentary, successive mental events.

Freud's account of the concrete nature of the conflicting urges and desires is more difficult of interpretation. His basal distinction is that of the sexual from the non-sexual. And unquestionably, especially in his earlier writing and in his psychoanalytic practice, Freud uses 'sexual' in the literal sense, teaching that mental disharmony always involves sexual desire, in the restricted sense of the term.[60] In this literal form, however, the doctrine can no longer be maintained, as the analysis of war neuroses has abundantly proved. For not the sexual but the self-protective urge is the dominant factor in the mental conflict of the shell-shocked soldier. As a matter of fact, Freud himself, at least theoretically, has adopted a wider use of the term 'sexual.' "Psychoanalysis," he says, "insists on the decided distinction between sexual and ego-impulses. . . . The non-sexual impulses we call comprehensively the ego-impulses. . . . The pathological struggle is waged between ego-impulses and sexual impulses. . . ." [61] The context shows that sexual means simply social or allocentric, as opposed to individual or egocentric. And this obviously personalistic conception, in spite of his obscure divagations from it, may perhaps most reasonably be attributed to the Freud of today.[62]

iv. Irrational Solutions of Mental Conflict as Sources of Fresh Conflict.—The pages next following call attention to the fact that irrational attempts to resolve mental conflicts are

[59] Über den nervösen Charakter, p. 15^{2}.

[60] *Cf.* Brill's statement of Freud's position in Fundamental conceptions of psychoanalysis, p. 30^{2}.

[61] A general introduction to psychoanalysis, p. 303^{4}. *Cf.* Brill, *op. cit.*, p. 29^{3}: The sexual is that which 'deals with love life.' His example is a woman's fondling of a rag, which she takes for a baby.

[62] The writers confess their inability to reconcile with each other all Freud's diverse uses of the term 'sexual.' In Das Ich und das Es (pp. 48*f.*), for example, he proposes to include the self-preservative impulses under the sexual and to contrast them with destructive impulses (*Todestriebe*).

themselves the source of fresh conflicts and disharmonies; and that such solutions may or must be conceived in personalistic fashion. Some attempt to harmonize contending desires is always made since, as Hart says, "conflict with its emotional tension and accompanying indecision and paralysis of action cannot persist indefinitely; it is a biological necessity that . . . some way out of the *impasse*, should be found." [63] Irrational solutions are sharply marked off from reasoned solutions of mental disharmony. These rational solutions proceed from the subject's reflective analysis and discriminating control of his warring desires and impulses, from his adjustment of them to each other and to the facts of his situation. The essential of such a solution is the deliberate and reasoning volition which the patient exercises. With such solutions, however, psychotherapy, in the narrower sense, is not concerned, for the patient is here his own physician.

Irrational solutions of mental disharmony, themselves the sources of renewed conflict, are, as the name indicates, unreasoned, and are often involuntary or 'impulsive.' They are further distinguished as ignoring or denying the facts or 'reality' of the patient's situation. This paper limits itself to the discussion of two fundamental types of irrational solution,—repression and identification.

Repression, the most drastic of the irrational solutions of conflict, is defined often in the terms, already criticized, of the impersonal complex and of the unconscious. Thus, Jung speaks of repression as "freeing from a painful complex from which one must escape . . . because its . . . oppressing power is feared"; [64] and Bjerre declares that "intolerable emotionally emphasized experiences and imaginations are forced away, denied, and made unconscious," [65] that is, repressed. If, however, one persists in translating these rather figurative terms into concrete psychological concepts, one finds that repression is the avoidance of mental conflict by

[63] *Op. cit.*, p. 79. *Cf.* A. G. Tansley, The new psychology, p. 84.

[64] Psychology of the unconscious, p. 73[3].

[65] History and practice of psychoanalysis, transl. by Barrow, p. 92[3]. *Cf.* Hart, Psychology of insanity, pp. 80, 84[3].

inattention, voluntary or involuntary,[66] to one of the conflicting units, an inattention culminating in pathological forgetfulness. Thus the little boy of our illustration 'repressed' his memory of the humiliating *contretemps* with the grocer, in other words habitually turned his attention from it toward some other object, until in the end he completely forgot it.

The limits of this paper wholly preclude a detailed discussion of the nature and the forms of repression, and of any adequate consideration of the basal therapeutic principle of psychoanalysis—the doctrine that mental disharmonies are solved by the abreaction of the repressed experience, the facing of the painful or humiliating situation. The point of our emphasis is that the concept of repression is more validly stated in personalistic terms than in the artificial terms of the 'complex.' Repression, it has appeared, is unquestionably a phenomenon of attention, in Tansley's phrase a 'refusal of attention,' [67] and as such, involves the self who attends. In an even more intimate sense, repression must be personalistically conceived. For, closely studied, repressed situations turn out to be, for the most part at least, those which are personally humiliating, those which, in McDougall's phraseology "must be looked for within the sentiment of self-regard." [68] The child is ashamed of his theft, the soldier of his terror, the lover of his lust, and therefore inattentive to it and forgetful of it. But shame is the self's unhappy awareness of being scorned by his fellow selves: it is an emotion wholly indefinable without reference to the relation of selves with each other. Repression accordingly, in so far as it involves this experience, belongs beyond a peradventure to the self-psychologist.

Repression is obviously a negative, a destructive procedure in which the patient tries, in the interest of mental harmony, to rid himself of part of his experience, to shut out one of the conflicting units. In identification the patient takes the opposite course: he seeks to widen, to enlarge himself by taking to himself the experience of some one else, by identifying himself with another person, imaginary or real. Here

[66] *Cf.* W. McDougall, Outline of abnormal psychology, p. 223[3].

[67] The new psychology, p. 270[2].

[68] Outline of abnormal psychology, p. 225[2].

the conflict is resolved, not by high-handedly banishing one of its units, but by equalizing them.[69]

Identification is, as everybody knows, a significant factor of phantasy or day-dreaming. It is the escape from conflict through the deliberate turning of attention toward an idealized self. Three points are particularly to be noted: first, the identifying subject is himself the center of interest. In whatever is done or happens he is the chief actor or participant or victim. In the second place, the self with whom he identifies himself always is the sort of self he would like to be in the sort of situation he would like to occupy. Even if the subject identifies himself with some one who suffers misfortune, yet the rôle of martyr in a day-dream always reveals a wish.[70] This character of the day-dream, it may well be noted, explains our reluctance to confide it. We readily tell our dreams of sleep because they do not usually reveal our desires even if they symbolize them; but we hesitate to pluck for others the heart out of the mystery of our phantasies. Finally, it must be remarked that the subject may identify himself either with a real self—with father or with mother,[71] with Lindbergh or with Stresemann, with Matisse or with Robert Frost;—or else one may identify oneself with an entirely imaginary but always wish-fulfilling personality. The psychic situation is essentially the same in the two cases.

No argument is necessary to make good the claim that identification can be described only in terms of personalistic psychology or, to state this more directly, that identification is an indubitably personal experience. To speak of successive mental processes or contents as identifying themselves, one with the other, is mere meaningless nonsense. Identification, on the other hand, under the name of participation (sympathy, in the wide sense of the term) is, as has appeared,[72] a root category of self-psychology. Social thinking and the

[69] *Cf.* Jung, Psychological types, p. 552.

[70] *Cf.* Freud, A general introduction to psychoanalysis, p. 105.

[71] These are Freud's emphasized instances, "The first and most significant identification of the individual is," he says, "that with one's father . . . (or better) with one's parents." Das Ich und das Es, p. 35, with note.

[72] *Cf.* p. 279 above.

diverse forms of sympathetic emotion are illustrations of the normal type of identification. When, on the other hand, the subject identifies himself with unreal persons in unreal situations, identification constitutes, as the preceding paragraphs have shown, a form of irrational solution of mental conflict. But it remains in either case a positively and inevitably personal experience.

III. Summary

In briefest summary: This paper has attempted to show, first, that personalistic psychology has a place for all the facts brought to light by psychoanalysts and, second, that both the basal concepts and the specific theories of psychoanalysis are obviously or else tacitly personalistic. The only disputed cases are the concepts (1) of the unconscious and (2) of the complex. As to the first concept, it has been shown that the facts on which is based the argument for the unconscious are explained by the self-psychologist without recourse to the notion of the literal unconscious. Furthermore it has been argued that both theories of the literal unconscious are untenable; and finally it has been proved that psychoanalysts themselves tend to regard the alleged unconscious as a kind of self, a dissociated personality. And in regard to the impersonal complex, it has been shown that psychoanalysts themselves are wont to alternate with the impersonalistic doctrine of the complex as independent mental process the wholly personalistic conception of the complex as a self's obsessing desire.

In a final paragraph the writers propose boldly, if briefly, to face the pragmatic question, already on the lips of their critics, *cui bono?*, of what use all this long-drawn-out argument? Psychoanalysis is a psychotherapy, not a psychology. Its problems are the crucial and urgent problems of resolving mental disharmonies, ending mental conflicts, effecting mental cures. What possible difference can it make, the critic asks, whether psychoanalysis uses the language of contending complexes or of self at odds with itself; whether it deals with unconscious mental processes or with forgotten cognitions.

To these questions, the writers have three answers. They urge, in the first place, that the considerations embodied in this paper, whatever their bearing on psychoanalysis may be, strengthen the case for personalistic psychology. To show that an important, modern application of psychology, psychoanalysis, presupposes personalistic conceptions is to show a fresh reason for adopting the personalistic point of view. The writers, however, are far from admitting the irrelevance of their conclusions to psychoanalysis. On the contrary, they persist in the old fashioned conviction that the discussion of basal concepts is no mere conventional appendage to an applied science. To state this more plainly, they urge that psychoanalysis, as applied psychology, should know more exactly what it is applying. Finally and more specifically, the writers register their conviction that psychoanalytic procedure would gain immensely if it could rid itself of the misleading influence of the impersonalistic conceptions incongruously mixed with its predominantly personalistic structure —if, for example, it could throw off the shackles of the complex doctrine. The hopeful and confident attitude which a good psychoanalyst seeks to develop in his subject is sharply at variance with the heavy and hopeless attitude toward a complex regarded as inevitable and impersonal force. And in somewhat similar fashion the patient's acknowledgement of the mysterious unconscious may paralyze his efforts to coöperate with the psychoanalyst.

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CANNON'S THEORY OF EMOTION: A CRITIQUE

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Introduction.—In 1884 and 1885, James and Lange,[1] working independently, propounded theories of emotion that have since been linked together as the James-Lange theory. James held that the emotion was the feeling of the bodily changes and specifically the visceral changes that took place immediately following the exciting stimulus. Lange, on the other hand, placed greater emphasis on the changes in the circulatory system. The essential features of these conceptions have been widely accepted. However, Cannon[2] has recently criticized the James-Lange theory and has presented an alternative view which, in the opinion of the writers, is open to a number of objections.

The aspects of the James-Lange theory to be defended here, are (1) that visceral, vasomotor, and other organic changes are necessary (but not sufficient) conditions for emotional experiences; (2) that movements, and changes in tension, of the voluntary musculature are contributing conditions; (3) that from the phenomenal standpoint organic and kinæsthetic experiences are essential (but not sufficient) aspects of emotion; and (4) that the 'feeling tone' of emotion can be resolved into these organic and kinæsthetic processes, and consequently is conditioned by bodily changes. By the conscious aspect of emotion, therefore, is meant an affectively and organically toned mode of response, conditioned at least in part by bodily adjustments. The unhappy atomistic

[1] W. James, What is an emotion? *Mind*, 1884, **9**, 189. C. Lange, Über Gemütsbewegungen. Übersetzt von Kinella, Leipzig, 1887.

[2] W. B. Cannon, The James-Lange theory of emotion: A critical examination and an alternative theory. *Amer. J. Psychol.*, 1927, **39** (Washburn Commemorative Volume), 106–124. Numbers in parentheses in the text refer to pages in this article.

implications and logical sequence of events found in many interpretations of the James-Lange theory are not necessary and are precluded in the present view. It is not supposed that emotion, as such, consists of organic and kinæsthetic sensations, or that we are afraid because we run. The mental and physical processes, alike, are regarded as abstractions from a unified, total reaction.

1. Use of Expression as a Criterion of Emotion When Organic and Postural Factors are Denied

The first question to be raised in a critique of Cannon pertains to the criteria he uses in ascertaining what is emotion and what is not. He cites cases in which cats, with the sympathetic division of the nervous system removed, evidently still exhibited emotion (108). There were present only certain outward *bodily changes* of the face and head by means of which to ascertain that the emotion was present (109). How, with only these as criteria, could he be sure the emotion existed? According to Cannon it did, although he admits that the evidence is indirect (109). He holds that if the James-Lange theory were true the operation would have destroyed the major source of the feeling.

Further, in this connection, he cites work done on human subjects who, though treated with adrenalin, experienced an 'indefinite affective' state, *without real emotion* (113). But he says, concerning decorticated animals, that the emotion was evidenced in the form of bodily effects. What then, is this illusive thing, emotion, that depends on bodily postures in some cases while in others bodily postures (trembling, nervousness) are irrelevant?

This same inconsistency appears several times. For example, Cannon describes cases of decorticated cats in which rage was exhibited (116). The emotion, as demonstrated by the bodily expression, disappeared only when the diencephalon was removed. But when we turn to human subjects, under the effects of anaesthesia and drugs, we find Cannon reporting that bodily changes took place, *although the patient was wholly unaware of what had happened.* To complete his argument,

therefore, Cannon should insist that these latter expressions are *not* evidences of emotion. Yet he uses the same type of movements to prove that, when the cortex is depressed, the thalamus remains functioning as the organ of emotion, for "the lower centers . . . show forth their functions in free play" (116). Is not Cannon relying here upon evidence from postural factors? It seems that in some cases the bodily changes correlate with emotion while in others they do not. It all depends upon the point to be proved.

Again, Cannon's evidence from cases of hemiplegia shows this same organic and postural reaction of which the patient is unaware; still the author considers it a criterion of emotion (117). But later, he assumes, referring to other cases, that patients may "have all the appearances of being convulsed with laughter, yet may not experience any of the feeling which the motions of face and body indicate" (117). This, when the bodily posture was used in animals to denote the presence of emotion.

Cannon's struggle to find a criterion for emotion involves him in still another contradiction, namely, the *relation of the thalamus to consciousness*. In drug cases the thalamus, for the purpose of his theory, is not supposed to be the organ of consciousness, for the subject is unaware of what is happening, and in the logic of Cannon's position, should feel no emotion. On the other hand, if the thalamus is the seat of affectively toned experiences, it must be an organ of consciousness. The author seems to admit the contradiction (118) but is not disturbed by it. He goes on to suppose that the effect of anæsthesia in abolishing consciousness leaves the *emotional expression* (the emotion, thalamic in origin) undisturbed (118), and that when these centers (referring to the thalamus) are released from cortical restraint they become a source of vivid affective experience (120). Not only does the question remain, Which is the emotion and which is not from the standpoint of external evidence? but the additional question arises, Is the conscious feeling conscious or unconscious? He has said that the subjects were wholly unaware of what had happened. Evidently the conscious feeling is not to be taken

into account in some cases as an integral component of the emotional experience.

What then can we say concerning the criteria used by Cannon to differentiate an emotional state from a non-emotional one? In referring to animal work he relies on the bodily expression as the criterion of emotion, and yet he denies that either visceral or postural factors have anything to do with the emotion. In other words, the evidence for emotional experience in experimental cases judged by one set of criteria is contrary to the evidence which he finds in certain human cases judged by a different set of criteria.

2. Lack of Specificity of Organic Changes

As his second point Cannon brings against the James-Lange theory the classical criticism that the organic changes lack sufficient specificity to account for the various emotions. "The responses of the viscera," he says, "seem too uniform to offer a satisfactory means of distinguishing emotions which are very different in subjective quality" (110). Granting for the moment that this is what Cannon would expect to find, how nearly does this check with the facts?

First, all of the more intense emotions are not only, as Cannon points out, similar in the *organic changes* that go with them, but they are also *subjectively* much alike. It is becoming increasingly apparent that the older classifications which suggested the existence of a large number of distinct mental states, each of which might deserve a particular designation, is rapidly breaking down. In the same way, studies of the nature of *affection* have reduced the former large number of affective states to a very few primary ones. *Gestalt* psychology has likewise removed the necessity of differentiating a specific group of emotions, since this type of experience is held to be a quality of the *total* experience and any change whatsoever in the conditions which arouse a perceptual configuration will give an entirely new affective state. The organic changes and the experience are alike in that an exact classification and differentiation is impossible.

Second, there is a likelihood that postural factors do play

an important part in giving specificity to emotion. The only evidence which Cannon offers in contradiction to this view is the work of Head which shows that in cases of the thalamic syndrome, postural changes are lacking in general feeling-tone (119). It is a considerable jump to argue from this that postural factors might not contribute to the *specificity* for which we are attempting an explanation, without arousing the entire emotion. Weeping, laughter, showing the teeth, and the like, are distinct postural factors aroused with distinct emotions. Cannon practically admits just this point in arguing from postural evidences in animals.

But, third, even if we were to admit that the organic changes were identical in all emotional reactions, and that the organism could isolate the influence of postural factors at the time he was experiencing an emotion, we would still have recourse to the fact that the *stimulus-situation* which aroused the emotion was distinctly specific. That fear can be isolated from fear of something, that love can be experienced in an abstracted state, and that anger is some sort of a thing that is applied, so to speak, to certain objects, is utterly illogical. Concerning this point we shall have more to say later.

Fourth, consider the constructive side of Cannon's work. What has he to offer in the place of organic changes to give us the necessary specificity of emotions? The activity of the thalamus is suggested as the basis for the 'peculiar quality of the emotion' (120). He says, "That the thalamic neurons act in special combination in a given emotional expression is proved by the *reaction-patterns* typical of the several affective states" (120). These reaction-patterns are the very postural and organic factors which Cannon denies have anything to do with the emotion. Moreover, he attributes to the thalamus specificity of functioning which he has denied to every other part of the system, but in so doing he directly contradicts himself, for the only evidence which he has that the functioning of the thalamus is differentiated is in the very specificity of posture that he has just denied. One is certainly led to ask the usefulness of positing two sets of structures—thalamus

and body—in which there might be this differentiated response in place of the one set (visceral and postural) of the James-Lange theory.

3. Insensitivity of the Viscera

Another inconsistency occurs in Cannon's third objection to the James-Lange theory pertaining to the sensitivity of the viscera. He seems to uphold two opinions regarding the nature of experiences coming from visceral processes. First, he avers that the viscera are relatively insensitive structures (111)—'extraordinarily undemonstrative'—and can be cut and torn without pain to the individual. But he then quotes Marañon to the effect that *the result of adrenalin is a host of visceral experiences.* There is precardial or epigastric palpitation, diffuse arterial throbbing together with oppression of the chest, tightness of the throat, and so forth (113). This, when the viscera are 'extraordinarily undemonstrative.' We can see no legitimate reason why Cannon should generalize from clinical evidence about the insensitivity of the viscera to the obviously complex organic reaction taking place during emotion. One is probably more or less unaware of specific visceral changes during normal experience, but is this any reason to suppose that one is totally unaware of the viscera during intense emotion? We are inclined to agree heartily with Marañon that there are hosts of visceral experiences. Cannon himself is perfectly willing to use this experimenter's results in substantiating his arguments *against* the James-Lange theory, but he is just as quick to disregard them when they contradict his views regarding the insensitivity of the viscera.

4. Diffuseness of Visceral Innervation

Cannon continues his arguments by pointing out that the innervation of the viscera is not particular but diffuse (111). Here he seems to imply that the amount of innervation of the viscera should be the criterion of emotional intensity, if the James-Lange theory were true. A more exact statement might be that there is a lack of differentiated sensitivity in

the viscera but at the same time the possibility of vigorous experience. Although the viscera in normal experience are more or less quiescent or dormant they are actually very potent and play an important rôle in emotion. What we must guard against, then, is the assumption that because the visceral sensitivity is not differentiated it is not an important factor.

We might note, also, that with certain of the senses, the greater the distance from the source of stimulation, the more highly specialized and the more differentiated or structured is the experience (eye, ear). The senses which require contact stimulation appear to give us a less differentiated experience and are much less specialized, while the organic senses give us an experience which is *still less* differentiated, involving less specialization of the organs. But it is certainly a mistake to assume that the less differentiated organs are any the less important in conditioning emotional processes.

We may draw an analogy here with the higher thought processes, the basis of a great many of which is *kinæsthetic sensitivity*. We find in unanalyzed experiences of these thought processes that there *is no awareness that kinæsthesis exists;* nevertheless, the fact that it is unanalyzed does not alter its significance. In a similar way, organic sensitivity is without doubt equally fundamental to emotional experience. That we do not analyze the visceral processes is certainly no reason for eliminating them as a basic factor of emotion. Conversely, the fact that when we do analyze out these organic processes we no longer have an emotional state seems further substantiation of the degree of their importance.

5. Arguments from the Temporal Course of the Emotion

Cannon's argument in respect to the temporal course of the emotion leaves us unconvinced. "It is clear," he says, "that the organic changes could not occur soon enough to be the occasion for the appearance of the affective states, certainly not the affective states studied by Wells" (112). In rejoinder we hold that (1) Cannon has been unfair in his treatment of

the material he presents, (2) that the evidence is inadequate, and (3) that much more evidence is readily available to show that the opposite conclusion is true, namely, that the time required for the arousal of an emotion would tend to show that some such factors as visceral ones were involved.

First, if he were to take the shortest time in which organic changes take place rather than the longest time, he would have a value in the neighborhood of .25 second. This is clearly less than the interval which he gives as reaction-times for affective experiences (112). We would have been much more impressed with this argument if he had been strictly fair in the interpretation of results and had not been so positive about data which do not warrant such absolute conclusions. Granting even that the visceral changes are as slow as Cannon would have us believe, there still remains the fact that in the data given by Cannon himself the differences between the reaction-times of the organic changes and the affective experience is so slight as to be of questionable significance. For instance, the reaction-times for smooth muscle which he reports are such as .25 second, .80 second, .85 second, while the time for an affective experience is also .80 second. Glandular changes appear to take somewhat longer, to be sure, but can one feel that this evidence is conclusive?

Second, the evidence which Cannon cites is rather inadequate. The only study which he reports is that of Wells [3] on affective reactions to pictures of men and women. On the basis of this single study in which the reactions are merely those of simple feeling, he proceeds to condemn a theory which includes other experiences as different from those used, as are the affective experiences of Wells different from simple perceptions. In addition, we challenge the validity of simple affective judgments as true emotional experiences. In experiments in our own laboratory on the affective values of color, of certain geometric forms, and of the brightness contrast, we find many observers who can make quite adequate judgments without any experience that they would call distinctly

[3] F. L. Wells, Reactions to visual stimuli in affective settings, J. EXPER. PSYCHOL., 1925, 8, 64.

emotional. Even presentations which are intended to arouse disgust or voluptuous feelings yield similar results. Our observers were able to report a type of experience that came almost immediately with the meaning of the presentation which was probably that which Wells observed, and yet there was an additional feature, a developing experience that came *only from three to fifteen seconds after the exposure of the material.* One observer reported that the experience was more vivid from two to three minutes later than it was at the time of the actual presentation. Judgments of the order of those reported by Wells and others, are, we believe, almost entirely cognitive in character and represent the arousal of meaningful aspects conditioned perhaps by previous emotional factors. In other words, we cannot feel that the evidence is sufficient to make any dogmatic statement concerning the temporal course of the emotion and least of all are studies such as those reported valid in this connection.

Third, we believe that a fair survey of the facts would lead us to the opposite conclusion. The balance of evidence seems to show that emotional experiences are typically *some time* in coming to their maximum strength. This fact would point toward the opposite interpretation, namely, that organic changes are an essential condition of emotion. We may have recourse here to many everyday observations which are of value because anyone can confirm them. The experience is commonplace of meeting either a dangerous or frightening situation and making some adjustment to it before one has an emotion. Anyone who drives a car has been confronted at some time with a situation requiring very quick action to avert an accident, and then has found himself, after the incident is entirely passed, quite unnerved, trembling, with quickened heart, and an extremely peculiar feeling in the pit of his stomach. It is this latter experience that is distinctly emotional. Leap a crevice in rocks or ice, or from the end of one moving freight car to another, the moment that one comes upon the situation, and the feat is readily accomplished. Stop for just a moment, appreciate ever so hazily what might happen if one were to fail, and within a few seconds the task

has become almost impossible. What is the first reaction to a person who suddenly strikes one, or hurls some insult into unsuspecting ears? Is it anger, or is it first of all surprise and astonishment, that a fraction of a minute later turns to keen resentment and then anger?

If we create an artificial situation in which emotional material is suddenly exposed on a neutral background, the observer is surprised that under the instructions to observe the temporal course of the emotion it requires a much longer time than he had originally supposed it would! *B* reports, "I'm astonished how long it took. The thing just seemed to grow on me. I reported when the experience just began to have a vague feeling. (This *O* averaged 4.6 seconds in his reports.) Even now the thing seems as real to me as it did then." Another *O* reported, "I saw the object and then pretty soon I began to feel something well up in me." This *O* reported at the end of 2.5 seconds. A third *O* said, "I saw the object and recognized that it was a face. Then it seemed to change and I realized what was wrong with it. At this time I got a distinct shock which I reported." (This *O*'s reactions were of the order of .9 second.) Though our experiments were in many ways crude and the experiences we obtained were somewhat vague, we did find that they were not immediate in appearance, and that under the conditions of the experiment the *O*'s were impressed with the length of time it required for the experience to reach its maximum.

Two other types of evidence go to corroborate our thesis. The first is the cumulative effect of emotional stimuli. More than one of our observers reported that after a number of the pictures had been presented to him, he began to have more distinct experiences. The same thing held true for the experimenters themselves. With material that was designed to produce nausea in the subjects, the operator himself began to feel uncomfortable after ten or fifteen minutes of looking at the pictures. This observation was repeated with other naïve observers who set out with a distinct bravado to show how impervious they were to such an influence. After some ten or fifteen minutes they would push the book away from

them and readily grant that they didn't feel well. This same thing is a matter of common knowledge for many of the other emotions.

A still further bit of evidence comes from the fact that the emotion persists in consciousness oftentimes long after the external conditions that produced it have been removed. What more logical explanation of the fact that these experiences are distinctly cumulative could be given than that they are conditioned in part by organic or visceral factors?

And finally, galvanometer,[4] electrocardiograph,[5] and plethysmograph [6] records show a delay in the organic changes that is correlated with the delay in the affective aspects of the emotional experience.

In summary, the bulk of evidence which comes from a consideration of the temporal course of emotion tends to confirm the James-Lange theory rather than to disprove it.

6. Treatment of Experimental Work on Organic Changes

Cannon's treatment of the experimental evidence on organic changes forces us to a consideration of certain general principles of psychological analysis. In his discussion, Cannon has cited evidence from the artificial induction of visceral changes to show that the changes so induced do not give 'real emotion.' No specific emotion was experienced, he says, in students who received injections of adrenalin sufficiently large to produce general bodily effects (113). Similar results are reported by Marañon in which his subjects received sensations of a most diverse nature and yet reported only that they felt 'as if afraid,' 'as if awaiting a great joy,' 'as if I were going to weep without knowing why.' It was only when 'an emotional mood already exists' after 'a talk with the patients concerning their sick children or dead parents' that this emotional state appeared. "Adrenalin

[4] N. Bayley, A study of fear by means of the psychogalvanic technique, Psychol. Monog., 1928, 38, 1–38.

[5] W. E. Blatz, The cardiac, respiratory and electrical phenomena involved in the emotion of fear, J. Exper. Psychol., 1925, 8, 109–132.

[6] R. H. Wheeler, The science of psychology, Crowell, 1929, 231.

induces in human beings," says Cannon, "typical bodily changes which are reported as sensations; in some cases these sensations are reminiscent of previous emotional experiences but do not renew or revive those experiences; in exceptional cases of preparatory emotional sensitization the bodily changes may tip the scales toward a true affective disturbance" (113).

Now the very obvious difficulty with such an interpretation lies in the fact that the conditions of the experiments were obviously artificial, that the entire setting was one which required analysis. Hence, under these conditions the only thing that the observers could report were the details of a new and unusual experience *which could not do more than approach* the typical experience in a natural emotional setting. Cannon apparently expects to find some simple experience induced by a single factor. He is surprised that people report only that they feel as if they were going to have the emotion. *This is the only way in which they could have the experience.* We can no more expect to find a single condition responsible for a thing like emotion than we can find a simple physiological basis of self, perception, meaning, character, intelligence, or any other one of a dozen psychological 'entities.'

Such attempts to find a one-to-one correlation between the processes which the physiologist isolates and the processes which the psychologist describes are doomed to failure. It is a return to the 'chemistry of the mind' expounded by the associationists of the last century. The good fortune of certain workers in finding a rough relationship between physiological processes in the sense organs and sensory experience had led many workers to presuppose that such a correlation is possible throughout. It has not been found. After fifty years of work we are even beginning to doubt the validity of such concepts as specific nerve energies. Where in psychological literature can one find support for the assumption that any single condition, or isolated set of conditions, can be responsible for a mental process of the order of emotion?

Our view must be this. Unanalyzed, emotions constitute

unitary experiences; analyzed and broken down, they appear as the product of a whole host of conditions involving every part of the organism. Reasoning, will,[7] judgment, meaning and emotion for the ordinary naïve observer are types of simple experience. Under natural conditions with no important factors omitted we get the 'real emotions' which Cannon expects to find. Under artificial conditions, with instructions or a setting requiring analysis, the emotion disappears. We now have sensations, images, a variety of stimuli, goals, experimenters, etc. In retrospect the emotion still exists, in the present it has given way to entirely new events—the isolated parts. These now are real. They, emerging from the natural previous situation, are important, for they give us clues to the conditions which were responsible for the former experience. But to suppose that these parts *are* the emotion is entirely unwarranted. They no more constitute the emotion than does a handful of pied type an exquisite poem. An examination of pistons, springs, batteries, and crankshaft may help us to know something about the *why* of a fine car, but taken apart it is something different.

In this lies the explanation of the results of the experiments. Under artificial conditions we get the parts. Marañon reports that with the injection of adrenalin his subjects got sensations of arterial throbbing, oppression in the chest, tightening in the throat, trembling, chilliness, dryness of the mouth, malaise and weakness. But in his and any other work of the same sort certain important conditions are absent. *There is no goal, nothing to be afraid of, joyful about, or angry at.* One would hardly deny that these things are very essential in a natural setting. We send people to the psychopathic ward that lack them. Is it not remarkable, then, that the subjects reported feeling as if they were going to be afraid, or as if awaiting a great joy? Is it possible to feel disgusted without being disgusted with something, to experience love in general, anger in the abstract, or sympathy with nothing? When the goal was supplied as Cannon reports above, the emotion was complete and normal. Just as the

[7] R. H. Wheeler, The action consciousness, *Brit. J. Psychol.*, 1929, 19, 253–267.

architect *with plans and ideas* can make a great building from bricks and mortar and lumber, so can the individual *thinking of his sick children* experience sorrow or sympathy. He now has a goal, a tension.

Equally important with the goal are probably a group of postural factors. No one has ever held that they do not contribute to the effectiveness of an emotion. Try to sit perfectly still and 'whip oneself' into a temper; relax completely and try to be exuberant. It is an utter failure. We might go on with a number of other conditions entirely lacking in these artificial experiments.

Another observation is of interest in this connection. It is the fact that those who reported definite emotions were runners or others who had been in athletic competition. These were precisely the people who were accustomed to artificial conditions of excitement and were consequently the ones who could most adequately describe the unusual situation which was now presented to them. The others resorted to a description of the parts which they could discover in the unusual experience they had failed to characterize in its entirety.

Such facts as these indicate clearly the direction in which the explanation of the experimental results lies. A consideration of the conditions of the experiment forces us to conclude that an adequate understanding of the process of analysis would have led Cannon and others to very different conclusions. The same criticism holds for Cannon's arguments with respect to organic changes in fever and asphyxia. These do not function as emotional factors when the emotional goal is lacking, but do function in giving to an emotion its distinctive quality when the total situation is present—when the pattern is complete.

7. Interpretation of Clinical Evidence on the Thalamus

We cannot find ourselves in agreement with the view advanced by Head and apparently adopted by Cannon that the quality of experience which we call emotion is a product

of thalamic activity. This interpretation is based in the case of Head almost entirely upon certain clinical evidence and supported by Cannon with the addition of experimental work. Though Cannon's experiments clearly demonstrate the difficulty with the view (116), he nevertheless accepts it in a dangerous form.

The clinical evidence reported by Head consists largely of cases of the thalamic syndrome in which lesions of the lateral nucleus of the thalamus give hyper-affectivity to certain types of experience. This center, in addition to being the source of practically all the thalamo-cortical tracts, is also held to be the termination of the cortico-thalamic tracts. Interruption of this path results in hyper-activity of the thalamus which is normally inhibited by the cortex. The usual form of this syndrome gives us a hyper-affectivity of such sensations as come from the affected side, but with the limens for all sensitivity raised on this side. "Thus, we believe, the essential organ of the optic thalamus is the center of consciousness for certain elements of sensation. The feeling tone of somatic or visceral sensation is the product of thalamic activity, and the fact that a sensation is devoid of feeling tone shows that the impulses which underlie its production make no thalamic appeal. It responds to all stimuli capable of evoking either pleasure or discomfort." [8] Cannon agrees essentially with this view when he says "the peculiar quality of emotion is added to simple sensation when the thalamic processes are aroused" (120).

We take exception to this view on three accounts. First, there is no evidence to show that the response *is limited to the thalamus alone*. In fact there is every reason to believe that just the opposite is true and that the impulses which are partially blocked off from the cortex pass uninhibited to the striate body (the motor portion of the older telencephalon) and hence to the viscera and musculature.

Not only do we have nothing in Head's work which would indicate that our own interpretation is not tenable, but we

[8] H. Head, *et al.*, Studies in neurology, N. Y., Hodder and Stoughton, 1920, II, 601.

have all of the evidence that Cannon himself cites which would show that this is an essentially correct view. For instance, he refers to certain so-called cases of narcolepsy in which the individual has little emotional experience and in which it has been found that there are lesions of the hypothalamus (117). *It is more logical to assume that these lesions interrupted paths from the thalamus to other centers rather than to suppose that this particular part of the thalamus was the seat of the emotions.* More significant than this, however, is the experimental evidence that decorticated cats exhibited the *organic changes* which the James-Lange theory holds to be essential (116). We need not go further into this material. Cannon himself admits it. What we do not understand is how he can admit this evidence and still hold that the changes in the viscera are without significance. Yet that is precisely the view of Head, to which Cannon apparently agrees.

A second difficulty has already received consideration. This is the fact that in all of the pathological cases reported by Head the experiences are extremely simple ones, those of unpleasantness, and in one case, of pleasantness. If the thalamus and the thalamus alone is responsible for all emotional expressions we should expect to find a much wider range of emotional experiences here. It would seem either that Cannon's argument for real emotions (our second point above) is invalid, or that other processes, probably of cortical origin, contribute to the pattern of visceral action and consequently to the emotion. We are inclined to accept the latter view.

Third, we cannot agree with the dangerous implication that a particular brand or element of consciousness is located in one center while other bits of it are located off in some other part of the nervous system. Yet this is exactly the assumption of Head, and apparently of Cannon when he says that emotional qualities come when thalamic processes are elicited. This is a very beautiful view for the physiologist but it leaves the psychologist with an impossible task. He must explain the fact that experience is always an integrated whole while the physiological processes which go on are discrete, partial,

isolated responses. He is then forced to imply a fleet-footed untiring mind which might dash from one center to another, assembling the simultaneous bits of experience which the physiologist has constructed so haphazardly for him. This view is fundamentally wrong and no psychologist would be willing to burden himself with it. Integration or wholeness is primary in psychology, not derived, and we believe that such a view is not far from the truth in physiology.[9] Consciousness appears as an *emergent integration* upon the entire functioning pattern of the central nervous system when that system has reached a degree of development which makes possible a sufficient spatial and temporal differentiation. Any view which holds that a particular organ is the seat of a variety of conscious processes is in violation of what we know of the genetic and comparative characteristics of behavior.

Finally, Cannon argues that because the viscera cannot function by halves, unsymmetrical feelings reported in cases of thalamic syndrome could not be conditioned by them, but only by the thalamus (122). James did not regard the viscera as the *seat* of the feeling. Naturally the visceral changes must be interpreted, perceived. A unified response of the viscera could be perceived unsymmetrically by virtue of an unsymmetrical dynamic pattern involving the thalamus, the cortex, and all the available connections between them. Accordingly, hyper-affectivity on one side of the body is not proof that the thalamus is the seat of the feeling.

8. Doubtful Nature of Cannon's Theory of Neural Organization

Cannon propounds a theory of the emotions based entirely on the functioning of one of the sub-cortical organs, the thalamus, which from the evidence he cites can function and the individual be *entirely unconscious of the fact.*

Specifically, his neural basis of emotion is as follows: An external object stimulates the receptor; impulses start toward the cortex; the arrival of the impulses in the cortex is associ-

[9] Recent works by Coghill, Tracy and others show that the development of behavior is a process of individuation, not a concatenation. *Cf.* G. E. Coghill, Anatomy and the problem of behavior, New York, Macmillan, 1929.

ated with conditioned processes which determine the direction of the response. Either because the response is of a certain mode or kind and the cortical neurons therefore stimulate the thalamic processes, or because on their centripetal course the receptor impulses excite thalamic processes, the latter are aroused and ready for discharge. (These neurons do not require detailed innervation from above in order to be driven into action; being released for action is the primary condition.) The neurons in the thalamus innervate muscles and viscera, but also excite afferent paths to the cortex, by direct connection or irradiation (120).

If we conceive that the incoming impulses from the receptors do excite thalamic processes of a certain pattern, as they obviously must in cases where the cortex is depressed, we see at once a certain fallacy in the theory. The ingoing impulse on its way to the cortex activates in the thalamus a certain combination of neurons that is to determine the reaction-pattern of the emotion, when discharged. The impulse must then pass on to the cortex where it is 'associated with conditioned processes that determine the response.' But the response *has already been determined in the thalamus* and only needs the necessary 'release for action.' What we have then is the thalamus taking on a *discriminatory* function when an excitable stimulus is presented. To give an illustration; we see a bear, the impulse goes from the optical receptors to the thalamus, where by a newly attributed faculty the thalamus arranges a combination of neurons necessary for fear. The impulse then goes to the cortex before the situation can be interpreted and we say 'bear, danger,' whereupon an impulse is sent from the cortex to the thalamus that releases the pre-arranged neurons for action. Then by 'irradiation' or 'direct connection' to the cortex we feel the emotion of fear. The absurdity of this explanation is obvious. We have the fear (consciously or unconsciously?) and are afterwards afraid!

If, however, we conceive the other alternative that the impulse must first travel to the cortex to be associated with 'conditioned processes that determine the direction of the

response' and that then the cortical neurons stimulate the thalamic processes, we must discard as emotional the abnormal and anæsthetic cases in which the cortical activity is depressed or inhibited. If we do regard these as emotional states, as Cannon does, then how can we get the necessary stimulation by the cortical neurons or even, for that matter, the 'release for action' which he says is necessary for the thalamus to function? Obviously, we must have two possible processes, one in which the cortex is involved and one in which it is not; but unless we have the thalamus taking on a third function, that of the awareness of the condition of the cortex, how can the thalamus tell when to function without stimulation from the cortex and when not to?

It might also be objected that unless there is attributed to the thalamus a discriminatory function all emotional experience would be identical, because of the equal (in Cannon's terms) impulses received from the receptors by the thalamus. What we have, then, are functions given to the thalamus that hitherto have been ascribed to the brain as an intact organization, a position which to say the least is incomprehensible.

We might go further. Cannon infers in his objections to the James-Lange theory that if the viscera were the source of emotional experience, there should be a localization of the affective feelings in the viscera, that is, the affective feelings must be localized in the conditioning parts. But then, according to Cannon's theory, all the feelings should be localized in the thalamus, which is just as absurd.

It seems that Cannon's criticisms would substantiate rather than refute the important features of the James-Lange theory. As far as the logic of the theory is concerned it is the same, there is only a change in the localization of the source of the emotional experience from the viscera to the thalamus. It is conceivable that in the phylogenetic development of the race, the thalamus might have been concerned in the production of the general undifferentiated response which is characteristic of certain lower animals, and some of whose features are carried over in the case of man, this type of behavior having arisen at a time when it was the

highest coördination of which the animal was capable. The thalamus, it should be recalled, was the first definite coördinating center to develop between the rather distinct systems of the primitive fore-, mid-, and hind-brains. It was when the cortex developed as a new addition to the fore-brain that there appeared a new type of differentiated behavior and the older type was correspondingly modified. This behavior remains today, not as the primitive behavior that once prevailed, but as a type which exists only in light of the entire nervous structure. The emotional experience will always be an activity of the organism-as-a-whole, and any attempt to substitute the functioning of a single organ or part for the activity of the entire organism will be doomed to failure.

Finally, Cannon supposes that the fact of intense emotion when overt bodily movements are inhibited offers a serious difficulty to the James-Lange theory (122). The answer to this objection seems almost too obvious to mention. As everyone knows, the inhibition of overt action does not mean bodily quiescence but a condition of rigid tension, a state that can very well furnish an *increased* instead of a decreased amount of proprioceptive stimulation.

Summary.—1. Cannon has been inconsistent in accepting postural factors as evidence of emotion in animals, and as indicative of emotion in drug and anæsthetic cases, while denying that these factors have anything to do with emotion. It has not yet been demonstrated that when visceral and postural responses occur, together with other necessary conditions of emotion, the former are not essential.

2. The lack of specificity of organic changes is not an argument against the James-Lange theory, for we find that 'real emotions' are phenomenologically much alike particularly if they are very intense. It is not an essential fact for the exponent of 'organic reverberation' that these processes differentiate one emotion from every other. Organic changes may be the necessary but not always the differentiating features of emotion. Moreover, the fact that similar changes occur in non-emotional situations, like asphyxia, does not militate against the theory. Differentiation may be

adequately accounted for in terms of postural changes, the stimulus-pattern, and the goal. A pattern of conditions must be complete before the typical emotion is experienced.

3. The relative insensitivity of the viscera during normal behavior cannot be brought against the James-Lange theory, which treats of crises in the life of the organism where action is intensified. The evidence as interpreted by Cannon is conflicting, but the facts themselves show that, on occasion, visceral responses are perceived as very marked.

4. The relative diffuseness of visceral innervation is not an argument against, but in favor of the James-Lange theory, for this factor conditions in part the very vagueness and diffuseness characteristic of many of the organic sensations reduceable from emotion. Moreover, the relative diffuseness of the visceral innervation is no criterion of the intensity or of the importance of the experience derived from the viscera.

5. The temporal course of the emotional experience when carefully observed confirms the view that visceral and postural changes are an essential condition.

6. Marañon's work substantiates the James-Lange theory and does not disprove it, as Cannon contends. Subjects do not feel genuine emotions under artificial conditions, even when the organic basis is present. There is no reason to suppose that they should. It is only when it is understood that under the artificial conditions of experimentation the subject will tend to break up his experience into isolated bits, that we see why it is impossible to get genuine emotions. It is necessary to hold that the organic changes, *together with* the perception of the exciting situation and a goal, are essential. Any constituent of this pattern might function in isolation or in some other pattern without inducing an emotion.

7. The clinical evidence for concluding that the thalamus is the seat of emotion is inconclusive. The view that visceral factors play an important rôle is in no way precluded. On the other hand, such a postulate as Head and Cannon advance sets the psychologist an impossible task of explaining the most essential feature of consciousness—its unitary character. We

must hold that the thalamic syndrome represents a disequilibration of cortico-thalamic patterns. This would mean that the central nervous system, as a whole, was still responsible for the emotion.

8. The neural organization hypothesized in Cannon's theory presents what would seem to be insurmountable logical and physiological difficulties. The thalamus must perform the discriminatory function of the cortex; it must somehow be aware of the condition of the cortex; this presupposes that the emotion arises in the thalamus before the exciting situation is apprehended; it substitutes the thalamus for the viscera as a single seat of a complex mental process.

In conclusion we offer the following general account of the necessary conditions of affective and emotional responses. Emotion is a function of a unified neuromuscular system. If visceral and postural factors are eliminated, there is no emotion; if the cortex is depressed, postural and organic changes may take place without emotion; when cortico-thalamic balance is disturbed, emotional experiences may be altered in various ways. Cortical, thalamic, organic, and peripheral conditions are all necessary. Of utmost importance is the interpretation of the situation, an insightful response which determines whether or not the emotional pattern will be complete, and therefore whether peripheral conditions shall function in emotion or in some non-emotional response. In short, the emotion is a configurational response concerned with the process of resolving a tension toward a particular goal. The qualitative aspects of this response inhere in its organization.

The valuable work of Head, Cannon and others on the function of the thalamus is all the more, rather than the less, significant if we do not attempt to locate emotion in that particular part of the brain.

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THE RELATION BETWEEN AFFECTIVITY AND SPECIFIC PROCESSES IN SENSE-ORGANS

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The view that there is a relation between affectivity and certain specific processes in sense-organs has been seeking recognition for well over a century. In the first part of his 'Elemens d'ideologie,' published in 1801, Destutt de Tracy maintained that the 'sentiments,' including joy and sadness, "sont de vraies sensations internes";[1] and as recently as 1922, Warren wrote: "A feeling is an experience in which systemic sensations are the main elements."[2] In the interval, variations upon the same general theme have been proposed by a large number of psychologists, including such eminent men as Stumpf,[3] Brentano[4] and Titchener.[5]

This view has never achieved widespread acceptance. Its detailed development has invariably encountered three major stumbling-blocks. In the first place, the problem of correlating pleasantness with a specific process in sense-organs —a process different from that underlying unpleasantness— has proved a hopeless puzzle.[6] Von Frey, it is true, sought to circumvent this obstacle by identifying pleasantness with the removal of pain,[7] but this expedient conflicted with the

[1] A. L. C. Destutt de Tracy, Elémens d'idéologie, Première partie, idéologie proprement dite, (1801) 1827, 25.

[2] H. C. Warren, Elements of human psychology, New York, 1922, 203–4.

[3] C. Stumpf, Uber Gefühlsempfindungen, *Zsch. f. Psychol. u. Physiol. d. Sinnesorgane*, I, *Zsch. f. Psychol.*, 1907, 44, 1.

[4] F. Brentano, Untersuchungen zur Sinnespsychologie, Leipzig, 1907, 112 and 119–25.

[5] E. B. Titchener, A textbook of psychology, New York, (1909) 1926, 260*ff*.

[6] "Ob ferner auch besondere Lustnerven anzunehmen sind, wie v. Frey Schmerznerven statuirt, ist . . . eine Frage der Physiologie, nicht der Psychologie." C. Stumpf, *op. cit.*, 22.

[7] M. v. Frey, Die Gefühle und ihr Verhältnis zu den Empfindungen, Leipzig, 1894, 17.

phenomenal individuality of pleasantness and with its frequent arousal in the absence of previous pain. In the second place, no processes have until recently been shown to correlate highly with unpleasantness except those underlying pain, and recourse to these has been precluded by the occurrence of pleasant pains.[8] In the third place, experimentation on the 'nature' of affectivity has led a number of investigators to the conclusion that affectivity is phenomenally distinct from the usually accepted sensory qualities.[9]

It is my conviction that all three of these stumbling-blocks have been removed by certain recent developments in experimental psychology. In the first place, investigation has shown that absolute judgments of weight and of affectivity depend in a quasi-identical manner upon the previous stimulation of the observer. Provided that extremes be avoided it can be predicted that in the case of any set of stimuli presented repeatedly for affective judgment the relatively most pleasant ones will eventually be judged absolutely pleasant, and the relatively least pleasant ones absolutely unpleasant.[10] Likewise, it can be predicted that if any set of stimuli not involving extremes be presented with instructions to give absolute judgments of weight, the observer will eventually call the lightest ones absolutely light and the heaviest ones absolutely heavy.[11] This points unmistakably, it seems to me, to a similarity in the physiological processes underlying experiences of weight and affectivity. But in the case of weight both the experiences absolutely light and absolutely heavy are conceived to correspond to a single type of process in sense-organs, which varies only in respect of the physiological concomitant of stimulus-intensity. Why, then, should a view

[8] E. B. Titchener, *op. cit.*, 261; A. Wohlgemuth, On the feelings and their neural correlate, with an examination of the nature of pain, *Brit. J. Psychol.* (Gen. Sect.), 1917, 8, 450.

[9] *Cf.* N. Alechsieff, Die Grundformen der Gefühle, *Psychol. Stud.*, 1907, 3, 264; M. Yokoyama, The nature of the affective judgment in the method of paired comparison, *Amer. J. Psychol.*, 1921, 32, 369.

[10] *Cf.* A. J. Harris, An experiment on affective contrast, *Amer. J. Psychol.*, 1929, 41, 617–624; J. G. Beebe-Center, The law of affective equilibrium, *ibid.*, 1929, 41, 64.

[11] E. G. Wever and K. E. Zener, The method of absolute judgment in psychophysics, PSYCHOL. REV., 1928, 35, 466.

concerning the relation of affectivity to processes in sense-organs be obliged to designate a specific process corresponding solely to pleasantness? Is it not far more probable that pleasantness and unpleasantness both depend upon a single type of process varying only in respect of the physiological concomitant of stimulus-intensity?

The second development to which I wish to refer is the establishment by Nafe of a high correlation between affectivity and sensory pressure.[12] All of Nafe's eight observers, under instructions to describe feelings as accurately as possible, eventually identified pleasantness with bright pressure and unpleasantness with dull pressure. It is clear that this identification cannot be accepted literally. P. T. Young's failure to duplicate Nafe's results with any but a former observer of Nafe,[13] together with Nafe's own statement that in order to experience these pressures an observer ". . . must maintain a psychological, non-perceptive attitude," [14] clearly indicate that the identification is contingent upon sensory instructions or their equivalent. On the other hand, this very contingence points to an equally significant alternative interpretation. It suggests, namely, that affectivity, though not a mode of pressure, corresponds to processes in sense-organs which, under sensory instructions or their equivalent, mediate modes of pressure. Such an interpretation obviously circumvents the two latter stumbling-blocks mentioned above. It provides as a concomitant of affectivity a specific process in sense-organs other than that underlying pain, and at the same time admits of a phenomenal distinction between affectivity and sensory qualities.

It is clear that these developments, besides removing certain stumbling-blocks, point to a fairly definite hypothesis concerning the relation of affectivity to processes in sense-organs. In the present state of our knowledge I believe that this hypothesis can best be formulated as follows: Affectivity depends upon a specific type of process in sense-organs, namely

[12] J. P. Nafe, An experimental study of the affective qualities, *Amer. J. Psychol.*, 1924, 35, 507.

[13] P. T. Young, Studies in affective psychology, *Amer. J. Psychol.*, 1927, 38, 175.

[14] J. P. Nafe, *op. cit.*, 540.

that which, under sensory instructions or their equivalent, mediates bright and dull pressure. When this type of process occurs under affective instructions or their equivalent it gives rise to relative or absolute affective experiences. Relative affectivity depends directly upon the relative density [15] of the process, greater pleasantness being mediated by a change of density which, under sensory instructions or their equivalent, would mediate greater brightness. Absolute affectivity likewise depends upon relative density, but in a more direct way. Absolute pleasantness depends upon a density differing from the average for similar past situations in a manner adequate to occasion greater pleasantness; absolute unpleasantness depends upon such a relative density adequate to occasion lesser pleasantness. The process in question is invariably proprioceptive. It is aroused by external stimuli—e.g. visual stimuli—indirectly through the muscular adjustments which they bring about.

This hypothesis accounts easily for the variability of affective judgments, for the long latent time of affectivity, for the close relation of affectivity to both movements and appetites, and for the hitherto inexplicable divergence between the results of experiments upon the 'nature of affection.' Its chief merit, however, is that it seems open to experimental verification. One of its most obvious implications is a high positive correlation between the brightness-dullness value of stimuli and their affective value. If observers be made to judge a set of stimuli on one occasion with respect to affective value, and on another occasion with respect to the brightness-dullness of their experiences, the results should show for all observers a correlation between brightness-dullness and affective value of the same order as are the correlations between affective values established for individual observers on two different occasions.[16] Another implication follows from Köhler's work upon the time-error in judgments

[15] Density is used here to represent the physiological correlate of stimulus-intensity. Should this correlate turn out to be frequency or some other characteristic the hypothesis could easily be altered accordingly.

[16] This implication is at present being tested by Mr. W. H. Hunt in the Harvard Laboratory.

of sensory intensity.[17] If pleasantness and unpleasantness be functions of the density of a single process in sense-organs, the time-error for relative affective judgments, whose existence has been established experimentally by Danzfuss,[18] must display a definite asymmetry. It must involve either an excess of judgments 'second more pleasant' for short intervals between stimuli and a deficiency of such judgments for long intervals, or a deficiency of such judgments for short intervals and an excess for long.[19]

In its present formulation the hypothesis is relatively indefinite. This fault, however, promises to be but temporary. The hypothesis does not, for instance, specify whether it is an increase in the density of the process in the sense-organs which underlies greater pleasantness or a decrease. Nafe is of the opinion that brightness—and consequently pleasantness—increases with the neural correlate of stimulus-intensity,[20] but a number of facts stand in the way of such a view. Physiological density might surely be expected to correlate at least slightly with phenomenal density; yet Nafe writes that, in the case of bright pressure, "The experience, as a whole, is found to be diffuse and volumic and within the pattern the brightness consists of discrete points, as in tickle and gooseflesh"; whereas ". . . In the experience of dull pressure the quality is . . . volumic and diffuse but less so than bright pressure."[21] Furthermore, P. T. Young has shown that the bodily reverberations in the case of unpleasantness are more rich and varied than in the case of pleasantness.[22] Increase in the intensity of the external stimulus,

[17] W. Köhler, Zur Theorie des Sukzessivvergleichs und der Zeitfehler, *Psychol. Forsch.*, 1923, 4, 115.

[18] K. Danzfuss, Die Gefühlsbetonung einiger unanalysierter Zweiklänge, Zweitonfolgen, Akkorde und Akkordfolgen bei Erwachsenen und Kindern, *Phil. u. psychol. Arbeiten*, 1923, 5, 18*ff*.

[19] This problem is now being investigated in the Harvard Laboratory by Mr. E. J. Ludvigh, Mr. J. Moscovitz and myself.

[20] J. P. Nafe, The sense of feeling, in 'The foundations of experimental psychology,' Worcester, 1929, 399. Nafe considers the neural correlate of stimulus-intensity to be frequency of impulses rather than density.

[21] J. P. Nafe, The psychology of felt experience, *Amer. J. Psychol.*, 1927, 39, 371.

[22] P. T. Young, Pleasantness and unpleasantness in relation to organic response, *Amer. J. Psychol.*, 1921, 32, 38.

finally, results as a rule in the eventual decrease of the pleasantness of the stimulus.[23] All of these facts, though not absolutely incompatible with Nafe's opinion, suggest the wisdom of witholding judgment in the absence of further evidence. The establishment, however, of a definite asymmetry in the case of the affective time-error would provide such evidence. If the time-error should be found to involve an excess of judgments 'second more pleasant' for short intervals and a deficiency of such judgments for long intervals, it could be inferred, on the basis of Köhler's physiological hypothesis, that increased pleasantness does indeed depend upon increased density. If, on the other hand, there should be a deficiency of judgments 'second more pleasant' for short intervals, and an excess for long, it could be inferred that increase of density mediates increase of unpleasantness.

The further indefiniteness of the hypothesis with respect to the locus of the process in sense-organs should likewise yield to experimental attack. Nafe has found that the bright pressure correlated with pleasantness is vaguely localized in the upper part of the body while the dull pressure correlated with unpleasantness is localized in the abdomen or in the lower part of the body.[24] From what we know of cutaneous and organic localization it seems reasonable to infer that the corresponding processes in sense-organs are somewhat similarly localized. It also seems reasonable to expect that further introspective work, combined with experiments involving selective activation of specific muscular groups, will enable us materially to increase this modicum of knowledge.

The most serious indefiniteness of the hypothesis arises from the phrase 'affective instructions or their equivalent.' Here, again, however, experimentation promises to be of some avail. No instructions appear to be necessary for the arousal of affectivity in the case of intense pain stimulation. Is this

[23] A. Lehmann, Die Hauptgesetze des menschlichen Gefühlslebens, 2nd Ed., Leipzig, 1914, 187; R. Engel, Experimentelle Untersuchungen über die Abhängigkeit der Lust und Unlust von der Reizstärke beim Geschmacksinn, *Arch. f. d. ges. Psychol.* 1928, 64, 1.

[24] J. P. Nafe, The sense of feeling, in 'The foundations of experimental psychology,' Worcester, 1929, 411.

so of all stimuli having high 'general affective value'?[25] Early classifications of odors rest largely upon affectivity—indeed Haller's classification was based entirely upon this characteristic.[26] Do olfactory stimuli—and perhaps taste stimuli—arouse affectivity in the absence of instructions more readily than do visual and auditory stimuli? It is often said that workers in chemical laboratories are affectively immune to odors. Is novelty an equivalent of affective instructions? Investigation of these questions involves a methodological difficulty but not an insuperable one. It is generally agreed that for the report of an event to be wholly reliable it is necessary that the instructions determining the report precede the event. This condition is obviously impossible of satisfaction in the investigation of the questions mentioned above. Reliability, however, is not subject to the all-or-none law. Everyday experience and the history of the *Ausfragemethode* show that postdetermined reports, though subject to the distorting effects of memory and suggestion, nevertheless yield results of fair reliability. In this case, then, as in the two preceding ones, the relative indefiniteness of the hypothesis is essentially an invitation to further experimental investigation.

The hypothesis formulated above is at present no more than a stepping-stone from experimental facts of the past to experimental facts of the future. Whether it is ultimately to assume theoretical rank will obviously depend upon experimental results. It has not the slightest pretension, however, to the rank of a theory. Boring has written: "In respect of the theory of audition it seems to me that we need fewer theories and more theorizing."[27] I believe this statement to hold equally well for affectivity. The hypothesis which I have presented covers but one of the many relations essential to a complete theory of affectivity. At best, therefore, it could develop into but a single feature of such a theory.

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[25] *Cf.* J. G. Beebe-Center, General affective value, PSYCHOL. REV., 1929, 36, 472.

[26] *Cf.* H. Henning, Der Geruch, Leipzig, 1916, 71*ff*.

[27] E. G. Boring, Auditory theory with special reference to intensity, volume and localization, *Amer. J. Psychol.*, 1926, 37, 157.

THE CRITERION OF INNATE BEHAVIOR

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I

The distinction between the innate and the acquired in human behavior, hallowed by long standing in psychological theory, has in recent years been subjected to an overwhelming flood of criticism. From the attack against the misuse of the concept of instinct in sociology and social psychology has developed the conviction that any separation of the influence of environment and heredity in the development of the individual is impossible. The argument has in the main been an extension of the point of view advanced by Stern in 1907 (**28**) that the individual mental phenomena and activities, as well as mental development as a whole, must be considered as the result of a convergence between inner dispositions and outer conditions of development. The individual represents not simply the gradual appearance of inborn qualities, nor the passive response to external influences, but the product of the interaction of environmental and native influences—the one without the other is meaningless.

In the discussion of the instinct problem during the last decade a similar point of view has frequently been set forth. Dunlap pioneered in pointing out the essential identity of instinct and habit (**11**). Complex adult activities, he states, cannot be analyzed into the original and the acquired components; all reactions are instinctive, all are learned. Similarly, Kuo declares that the "distinction between inherited and acquired responses should be abolished" (**23**, p. 439). He goes farther than the other writers in that he denies the existence of instincts and, consequently, of habits (**24**). Eggen believes that all types of behavior which have been included under the name instinct may be identified with emotion, reflex, or habit (**12**). Bentley conceives the develop-

ment of a socialized person as "the product (not the sum) of (1) racial stock, (2) the sheer processes of growth, (3) the moulding influence of the physical surroundings, (4) intercourse with other beings, and (5) the impress of institutions, traditions and customs" (**2**, p. 411.) Koffka, while emphasizing the importance of native behavior, subscribes to Stern's theory of convergence because it avoids the extreme viewpoints of nativism and environmentalism (**21**, p. 51). In the clearest and most convincing treatment of this viewpoint, Carmichael (**4**) has reviewed an array of physiological and neurological evidence to invalidate the traditional distinction between the innate and the acquired elements of human behavior.

I can have no quarrel with the basic argument of these writers that all processes of development represent an interaction of inherited influences with environmental influences. It is because the convergence theory practically precludes the possibility of experimental investigations—because it dismisses the problem of innate behavior—that I must take exception to it. Kuo's objection to the instinct hypothesis as making for a 'finished' psychology (**22**) might in turn be applied to the convergence viewpoint as it has been interpreted. Is it necessary to conclude that heredity and environment cannot expediently be separated, "for in all maturation there is learning; in all learning there is hereditary maturation?" (**4**, p. 260). Or must we stop where Jennings does, with the statement that "the characteristics of the educated man are his native, inherited characters, just as truly as are any that he has?" (**17**, p. 50).

This paper will present certain evidence to show that a valid distinction may be drawn between inherited and acquired behavior. This must not be interpreted as an attempt to support any 'instinct' theory, nor to evaluate the relative 'importance' of heredity and environment. It is intended rather to provide a basis for genetic experimentation by pointing out an objective difference between the processes of maturation, strictly defined, and learning.

There have been many criteria proposed for the separation

of the inherited and acquired elements of human behavior, and their manifest inadequacy has been in large measure responsible for the current adoption of the convergence viewpoint.[1] The objections to the criteria of universality within the species, adaptiveness without foresight of the end, presence at birth, and execution without previous practice have been repeatedly stated, and it is well recognized that these characteristics do not serve as a differentiation. It may be that innate activities are those carried out at subcortical levels, and that the cortex operates only in the conditioning or learning process. This suggestion has never been enlarged upon, but is implied in the writings of Morgan (**26**), Pavlov (**27**), Allport (**1**), Herrick (**15**) and many others. While it has the advantage of objectivity, this criterion presents certain difficulties. In the first place, it is known that invertebrates with no cortex, such as the earthworm, the snail, and even protozoa, are capable of learning in a certain degree. Moreover, the experiments of Lashley (**25**) show that removal of large areas of the cerebral cortex of the rat does not prevent the formation of simple habits, and Jellinek and Koppanyi (**16**) report similar cases in which all or nearly all of the cortex was destroyed. Another differentiation has been proposed by Wells and by Koffka in their conception that under 'normal' environment, the development of an individual may be considered due to inheritance. "Heredity," writes Wells, "is not synonymous with 'intrinsic' or 'germinal,' but includes normal environmental conditions" (**30**, p. 159). Acquire characters, then, are traits developed in an abnormal enviroment which are not inherited in a normal environment. Koffka, while recognizing that maturation is not altogether independent of the individual's environment, considers that "under 'normal' conditions, the course of these developmental phases is primarily dependent upon the laws of heredity" (**21**, p. 38). But the difficulty of defining normal environment still remains. The environment cannot in itself be measured; it is normal if it gives rise to a normal

[1] We are not concerned here with 'instincts' as they are differentiated from reflexes, but rather with the broader problem of the inheritance of behavior.

individual. The 'normality' of the individual, in turn, can be measured only by reference to a mean individual. We have come no closer to a definition of inheritance by including a normal environment in the concept.

II

It must be obvious to anyone who has the opportunity to examine the evidence offered by studies in biology, embryology, and physiology, that development cannot be explained except as the constant interaction of the organism with the conditions affecting it. To understand the true meaning of this interaction, it is necessary to approach the problem genetically. The individual has its origin as a single cell: a complex physico-chemical system existing in another physico-chemical system, the environment. The cell exists only in relation to the environment, and its development into the highly differentiated adult organism is possible only through environmental influences. Heredity cannot be thought of as a 'force' which impels the development along a certain preformed direction. The original constitution of the germ cell (and whether or not this is found in the chromosomes need not concern us here) determines the mature individual only by its relation with the environment.

The terms 'organism' and 'environment' have been used in psychological literature with rather loose definition. The concept of behavior as an interaction of 'the organism as a whole' with the environment has been a popular one, and, it must be admitted, a useful one, but the limitations become apparent upon close analysis. It has already been pointed out by many writers that the physiological state of the organism, that is, the sum total of the processes carried on in the cells, tissues, and organs at a certain time, must be taken into consideration. But is this physiological state to be included as organism or as environment? Obviously, it cannot be set apart as either one. It is an interaction of *parts* of the organism, not necessarily with the external environment, but with the immediate environment: the tissue fluid, blood, autocoids, etc. This activity is of course de-

finitely involved in the response of the organism as a whole to the external environment, yet it is not itself a response to external conditions.

For the purposes of the present paper, the effective environmental influences will be considered in three groups. The first of these I shall designate as the intra-cellular environment.[2] The single cell is not a homogeneous unit. The simplest cell that has been studied exhibits a certain differentiation of function among parts of the protoplasm. There is consequently an interaction between different regions of the cell. The physiological phenomena of the single cell includes the activity within the cell in relation to *intra-cellular* stimulation, as well as the responses to influences of the environment acting from without.

The second group of environmental conditions, the *inter-cellular*, embraces those influences exerted upon any given part of the organism by the remainder of the organism. A single cell may be so isolated that it has no connection with the environment external to the whole organism. Its activity, in addition to the intra-cellular processes, will then be an interaction with its immediate surroundings—the proximal cells and the tissue fluid. Similarly, the behavior of a group of cells or a tissue is initiated and controlled by stimuli from the organism itself.

The influences of the *external* environment comprise the third group. These stimuli act upon the total organism; they modify the existing continuous processes to produce what we call a response of the organism as a whole.

This classification of the environmental conditions is not intended to convey the impression that the three groups are independent categorical entities. The distinction has been drawn in order to point out a fundamental temporal difference. While the intra-cellular stimuli represent the result of previous external influences which mold the constitution of the cell, their functioning *at any given time* is independent of the external environment. Similarly, the inter-cellular stimuli

[2] This classification should not be confused with that presented by Sherrington for the phenomena of general physiology. *Cf.* The integrative action of the nervous system, New York, 1906, p. 4.

may be traced back to an ultimate dependence upon external conditions although they may be said to act independently at any given time. The organism, then, represents a double system within a system. External conditions will have an immediate effect upon the behavior of the organism as a system; their influence upon the inter-cellular and intra-cellular processes is delayed and indirect.

The possibility of establishing a distinction between inherited and acquired functions may now be based on a consideration of these facts: (1) A specific and constant environment is provided for the developing embryo by the parent organism. (2) To the extent that the development of any activity is an interaction of an inherited[3] environment with an inherited germ cell, we may say that it is innate. Let me now point out more fully what I mean by the inheritance of environment.

In the course of the evolution of species, variations in the embryonic conditions are reflected in the characteristics of the adult organism just as variations in the germ plasm are. Through the selective action of the evolutionary process—whether natural selection, mutation, or the inheritance of ancestral habits—the environment of the embryo has been standardized in each species so that the development can take but one course. A constant environment is necessary, and any appreciable deviation will result in abnormal development or death of the embryo. The progressive standardization of this environment in the phyletic series is apparent in the degree to which the embryo is protected from the extremes of environmental stimulation, and in the degree to which environmental conditions are maintained constant.

In the protozoa, reproduction by fission brings two new organisms into the same environment in which the original cell existed. In the metazoa, the simplest forms show a

[3] The term 'inherit' is used advisedly in this connection. Geneticists have always limited the mechanism of heredity to the constitution of the germ cell. The environment of the embryo, which is just as definitely derived from the mother, might be considered as *beta heredity*. Homologously then, the social and cultural environment, which sociologists describe as perpetuated by institutions, education, etc., could be termed *gamma heredity*.

specialized protection of the newly forming organisms. Asexual reproduction in the volvox is accomplished by the division of certain large cells (parthenogonidia) which at first occupy a place in the wall of the mother colony and later move into the central cavity. Here growth proceeds by cell division until the wall of the parent colony breaks down and the new organism begins its independent existence. But not until maturation has reached a relatively advanced stage is the embryo exposed to the external environment. During the formation of the bud in asexual reproduction of Hydra, both the body wall and enteric cavity of the bud are continuous with the corresponding parts of the parent Hydra, and only when the bud is fully developed, is the attachment broken. In the earthworm, the sperm and eggs are deposited in a mucous secretion which contracts to form a cocoon. The development then proceeds by cell division within this specialized and adapted environment.

Among the higher forms, there appear many mechanisms which insure to an even greater extent that the interaction of the developing organism with its environment will be standardized. The egg may be attached to some solid object as by Mollusca; it may be carried attached to the surface of the body, to appendages, or in skin folds as by Crustacea and Amphibia; it may be deposited in very specific and well adapted locations as by certain species of Insecta. Developing from the simpler protection of the egg by an enveloping jelly or capsule, the increased storage of yolk provides for prolonged development, while in certain species the egg is protected with an albumen coat and shell. Among the mammals there is a marked gradation from such forms as the Echidna, of which the females are ovoviviparous, through the Marsupials whose immature young are carried after birth in a special sac on the ventral abdominal wall, to the Primates in which the period of gestation is the longest. In these higher forms, there is not only the protection against accidents (extreme environmental changes which are so fatal to the eggs of lower forms) but there is provision for a definite environment which directs the maturation specifically.

The external environment of the human embryo is a very limited one. The range of effective stimulation has not been satisfactorily determined as yet, but one is fairly justified in ascribing those responses of the embryo which are not endogenous in origin to the purely mechanical stimulation of the surrounding tissues or to the composition of the tissue fluid of the parent. This environment, it may be seen, is derived directly from the parent, in a manner comparable to the inheritance of the germ plasm, and, as has been suggested, may be termed *beta heredity*.

The mass of evidence from embryology indicates that the external environment of the embryo (except in the possible case of extreme variations causing teratosis) is constant, and within a range of variation maintained by the parent has little specific influence in producing individual differences. In the tissue fluid of humans, there is a constancy of temperature, oxygen, salt balance, osmotic pressure, and hydrogen-ion concentration which is unequaled in the developmental environment of any other form. But besides this definite, constant environment, there is provision that other stimuli will have little influence except insofar as they are reflected indirectly in the tissue fluid of the mother. A stimulus, thus transmitted by way of the tissue fluid, naturally loses its specificity. Although training the parent may increase proficiency in typewriting, it is commonly recognized that the possible changes in the tissue fluids can have no such influence on the typewriting ability of the offspring. Even the introduction of chemicals directly into the blood stream is prevented in many cases from having extreme effects, by the buffer action of the plasma. Dr. J. S. Haldane has calculated that it would be necessary to drink one gallon of tenth-normal hydrochloric acid to produce a change in the pH of the blood from 7.35 to 7.1.

It should be noted here that the influence of this standardized environment does not cease at birth. Although the organism is removed from the constant external environment of the uterus, it has created during the period of gestation an internal environmental system which plays a significant rôle

in the post-natal development. The blood and tissue fluid do not, of course, represent a permanent media. The formed bodies have a life of from twenty-four hours (lymphocytes) to thirty days (erythrocytes). The oxygen and salt content change continually with the demands of the body and with the supply made available. But the body has a mechanism for regulating the composition of the internal fluids, and this is maintained at a constant which is characteristic for the species. The inner environment, then, may be considered as homologous with the external environment of the organism in utero: providing a stable, standardized set of conditions which continues the maturation. External stimuli have only a delayed and indirect influence on this inner environment, and under experimental conditions, when certain specific environmental influences are eliminated, we may discover what phases of development are capable of being carried out by the interaction of the organism with the inner environment—a process known as maturation.

III

When we consider the more strictly psychological problem of the development of behavior, we are dealing with the dynamic energy relationship between the organism and the environment. How does the nervous system mature to make possible the complex and integrated behavior of the fully formed individual? In this respect we must guard against an overemphasis upon the nervous system as a new function emerging in development to assume the direction and control of activity. Behavior, conceived in its broadest sense as a metabolic change in response to environmental stimulation, is present in the functioning organism from the very first. The simplest protoplasmic mass exhibits the properties of irritability and conduction to a certain degree, and a one-celled organism is capable of an integrated response to a stimulus applied at only one point of the membrane.

In the maturation of the human organism, the neuron develops from the embryonic cell, the neuroblast. The outgrowths from the cell body are of two kinds: an axon and one

or more dendrites. The final relations of these extensions are often quite different from their relations in early stages of development. There may be a resorption of certain collaterals, as in the Purkinje cell, or there may be a sudden and definite change in the direction of growth of axons and dendrites at certain points in their course. The potentiality of growth is residual in the neuroblast just as it is in less differentiated cells. Harrison (**14**) has shown that nerve cells separated from the embryo and immersed in lymph continue to grow and branch. But the direction and the extent of growth must be explained as an interaction of the cells with their specific environment. Neurology has accumulated a vast body of factual material dealing with the morphology of the nervous system, but there is as yet little experimental work on developmental physiology. In the present state of knowledge, no adequate concept of the maturation of neural patterns can be formulated. I shall present certain evidence, however, which indicates that the influences which are concerned in neural growth are those of the *inter-cellular* environment, and consequently are to a large extent independent of external stimulation.

First of all, it may be noted that the developing embryo is a buffered system—it is protected from certain external stimulation and assured of others in a variety of ways. There is present, of course the fundamental protoplasmic excitation and conduction, but before the specialized neuron is developed conduction is slow and decreases in intensity and effectiveness with increasing distance from the point of stimulation. Moreover, when the nervous system is in the early stages of differentiation, the order of development is such that external stimulation is precluded. The neurons in general develop from the central spinal cord region to the periphery. Coghill (**9**) has pointed out clearly that in the development of Amblystoma, the pattern of the neural structure is quite definitely laid down before the neuron conducts the sense impulse. For example, the conduction paths for the optic centers to the brain stem, notably the fasciculus longitudinalis medialis, is completed before the optic nerve approaches the

brain. Similarly, the fibers of the optic nerve penetrate the brain before bipolar cells or rods and cones can be recognized in the retina. Likewise, the primary and secondary olfactory centers of the brain are relatively advanced in differentiation before they establish a connection with the nasal epithelium through the olfactory nerve. Tracy (29), in his study of the development of behavior in the toadfish, has shown that the motor pathways mature first, and that during the earliest stages of activity, the afferent system, both exteroceptive and proprioceptive, is largely undifferentiated. Facts of the same import are found in connection with the human embryo. After eighteen weeks of development, at a stage when body movements are of the simplest order, that part of the mechanism of association which deals particularly with the highest mental processes has definitely begun to organize itself into the structure that characterizes it in the adult (3). The Betz cells of the motor cortex are highly differentiated, the motor and visual cortical areas are well defined by their characteristic lamination, and lamination has begun even in the prefrontal region.

It must be understood that the conception of ontogeny here presented does not disregard the fact that growth and function are carried on simultaneously in the organism. Living protoplasm is functioning at all times. The structural pattern of the nervous system is not laid down before activity can commence; neither is the possibility of further growth precluded when function begins. But cells may acquire a specialized function by their development. The neuroblast does not possess the peculiar conduction possibilities of the mature neuron. At some stage in its development, the nerve cell begins to function as a specialized conduction unit, but even at that stage, as has been pointed out, the connection with the external environment has not been made. We must look for the stimulating conditions, then, in the inter-cellular environment.

Jennings has demonstrated that activity occurs in lower organisms without present specific external stimulation (18, p. 284). While this spontaneous activity depends finally on

external conditions in the same sense that the existence of the organism depends on the external environment, the movements are undoubtedly the expression of energy derived from metabolism. The point of importance is that this activity depends more on the past external conditions, which act indirectly through the agency of the inter-cellular environment. Tracy has observed that the toadfish at hatching does not respond to any ordinary external stimulation. Yet during the embryonic development body movements are characteristic. It must follow that the movements of the embryo are activated by inter-cellular stimuli. He concludes that "spontaneous movements are those which, under certain homogeneous environmental conditions, arise in a protoplasmic system when the external energy relations remain constant; they appear to be dependent on periodically recurring variations in internal energy conditions and hence tend to be rhythmic" (**29**, p. 353). Coghill, in a summary of his extensive investigations of the growth of the nervous system in Amphibia, concludes: "We find no evidence that the growth of nerve cells in Amblystoma is stimulated by nervous functions. Indeed there is very strong evidence against this hypothesis. Within the motor mechanism at least, the behavior value of a new performance can have no causal relation to the growth of those structures which make it possible; and forced exercise and stimulation do not perceptibly hasten the development of the behavior pattern" (**10**, p. 55).

Further proof that the maturation of behavior may be independent of external stimulation is found in the experimental results of Harrison and Carmichael. Harrison grew frog embryos in 0.02 percent solution of chloretone, which acts on the nerve centers to inhibit all activity although permitting normal growth. He found that when the organisms were replaced in tap water, they were soon responsive to tactual stimulation and exhibited free swimming movements. "The quick acquisition of the power to carry out these movements shows that the mechanisms in question develop in perfect order, without the influence of normal function in

each successive stage" (13, p. 216). Carmichael has more recently carried out a series of well-controlled experiments on the development of Amblystoma embryos removed from the influence of external stimulation. He used a slightly more concentrated solution of chloretone, and by comparison with a control group allowed to develop in normal tap water, found results similar to those of Harrison (5). Moreover, the time elapsing between the removal of the animals from the anæsthetizing solution and the appearance of the functional reflexes was demonstrated to be no longer than the time required for the elimination of the effects of the drug, and so could not be considered a 'learning' period (6). In an experiment reported later, a group of embryos were grown in a sound, light, and vibration proof laboratory room. "No difference in behavior could be noted between the individuals of the experimental group, and those of the two check groups" (7, p. 258). While these results point clearly to the fact that development of behavior may be independent of specific stimuli from the external environment, Carmichael concludes with the perfectly true but evasive statement that "development of the behavior mechanism is not alone dependent upon heredity or environment, but that it is the result of the interdependent action of both of these factors" (6, p. 47). But is not the effective environment in this instance an internal environment, and, as has been pointed out, one that is derived from the parent organism? While this experiment gives no clue to the physiological mechanism involved in the genetic development of motility, it does show that such development, at least in the early stages, may be independent of exercise.

The most noteworthy attempt to explain the direction and extent of growth of embryonic tissue has been the theory of neurobiotaxis, advanced by Kappers (19, 20). The development of the nerve cell is said to represent a galvanotropic reaction to an electrical field set up by the excitation of neighboring neurons. The cell body and dendrites migrate in the direction of the functionally active nerve cells. The morphological polarity of the neuroblast is thus determined by the electrical field in which it develops; the dendrites

originating on the side toward the cathode, and the axon on the side toward the anode. Child (**8**) has pointed out some of the difficulties and limitations of this hypothesis, and in his modification of it, seeks an interpretation based on his theory of physiological gradients. Individual neurons, and the nervous system as a whole, develop in a direction down the gradient. He claims that regions of high metabolic activity; *i.e.*, growing or functioning regions, are characterized by possession of a negative electrical potential which is the property guiding the growth of the dendrite and axon. The region of highest internal positivity is the embryonic neural tube. The electropositive regions of the neuroblast will then appear primarily on the side of the cells away from the central canal, and, in the case of the motor neurons, give rise to the axon. Those who would dismiss the problem of innate behavior as the product of a 'convergence' cite this work to show that the earliest neural growth is not predetermined, but is a response to environmental stimulation. This statement is of course true, but if we return to the previous analysis of 'environment,' it is clear that the effective stimuli for this development are found within the organism. The electrical field which determines the polarity and growth of the neuron has at this stage no relation to the functional activity of that neuron as a conductor. The external environment has no specific effect upon these processes of development.

IV

The evidence here presented is intended to justify the conclusion that there is a fundamental difference between the processes of maturation and learning. Both processes, it is true, represent an interaction of organism and environment, but learning is distinguished from maturation by this fact: It represents a modification of the organismic pattern in response to specific stimuli present in the external environment at the time of the modification. Maturation, on the other hand, is a modification of the organismic pattern in response to stimuli present in the inter-cellular and intracellular environments, which at the given moment are in-

dependent of external influences. I have pointed out that at least in the early stages of development, the environment which is significant for the development of the organism is derived from the parent in a manner comparable to the inheritance of the germ plasm.

It is not our concern here to attempt to evaluate the relative rôles of maturation and learning in the development and perfection of behavior. It is rather to offer a basis for the interpretation of an extensive body of data which is without meaning in the light of the convergence viewpoint. The experiments of Carmichael and Harrison on motility in Amblystoma; Bird, Shepard and Breed, Breed, and Mosely on the pecking response of chicks; Conradi and Scott on the song of birds; Berry and Yerkes and Bloomfield on the mice-killing activities of kittens; Craig, Stone, and Whitman on sexual behavior of doves, rats and pigeons, respectively; and Gesell and others with human infants, become significant and suggestive material in connection with the distinction here drawn between maturation and learning.

It is equally important to study the maturation of the embryo *in utero*. The observations of Langworthy, Swenson, and Avery on the behavior of pre-term kittens, rats and guinea pigs, and of Preyer, Minkowski and Bolaffio and Artom on the activities of the human fœtus suggest the possibilities of study in this phase of the problem of development.

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COÖPERATION OR CONFLICT IN THE STUDY OF LEARNING?

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"The psychology of learning is a scene of confusion and violent disagreement," says Bode.[1] Looking to psychology for guidance in teaching and learning, he finds some three distinct and *mutually exclusive* theories of learning, and adds another that is derived from his definition of the 'nature of mind.' We need not concede that the situation is as bad as Bode paints it; and, in the interests of untrammeled experimentation, we may insist on considerable freedom in defining learning and the problems of learning. But we surely would prefer a larger measure of consistency and intelligibility than now prevails in this part of our science.

This harmony I am sure will not be found by Bode's method, which starts from some definition of 'mind.' The existing confusion springs probably not so much from philosophical premises, as from faulty summaries of the facts observed. I believe the underlying error consists in giving to laws of learning the form of *necessary consequence*, which is warranted in physics, chemistry and biology; whereas the facts of learning seem to support laws only of the form of *necessary antecedence*. To this source I shall trace the present confusion and conflict. Then I hope to show how, avoiding this error, in terms of laws of necessary antecedence each program of empirical research may be assigned its place in a single, harmonious psychology of learning.

Current formulations of laws of learning are reduced by English[2] to three laws; and I believe no important error is made in adopting his summary of the present situation. The

[1] B. H. Bode, Conflicting psychologies of learning, 1929, p. iii.

[2] H. B. English, Student's dictionary of psychological terms, under caption, 'LEARNING, LAWS OF.'

Law of Use states that "whenever an act takes place . . . it is thereafter more readily repeated"; and the Law of Cohesion states that "acts which occur at the same time or in close succession tend to form a unity, thus becoming a complex act of a higher order." It is hardly necessary to remind my readers that neither of these statements, though commonly assumed, accord with the facts. Occurrence of an act often inhibits repetition; and concurrence of acts gives no assurance of their combination. Woodworth none the less says [3] "the dominant activity of any moment tends to absorb any other present activity, and thus to establish a connection, which is strengthened by repeated use." Here the laws of use and cohesion are both asserted in the form of universal, *necessary consequence*. To be sure it is said that this necessary consequence is only a 'tendency': but we have no evidence of *any* universal consequence. What we *observe* is that sometimes the cohesion follows, and very often it does not. 'Tendency' is merely a generally accepted device for giving a law the *form* of universal necessary consequence, which the facts observed do not warrant.

That laws of learning are heedlessly formulated as laws of necessary consequence is all the more remarkable since the *problems* of learning demand laws of necessary antecedence. For example, in the well-known studies of 'fears' the problem was to learn which 'fears' are native and which are learned, and by what experiences they are learned. The conclusion is that for fears of sudden sounds no prior experience is necessary; but for fears of furry things certain prior experiences are necessary. But such experiences often do not produce fear. To ask what learning *follows upon* a given experience would lead us anywhere or nowhere. We ask what are necessary antecedents, or *sine qua non's* or 'minimal essentials' of a desired form of learning; and we also ask what additions to these necessary antecedents are statistically the most promising and therefore the most economical. Such questions empirical laws of learning may fairly answer, on the basis of

[3] R. S. Woodworth, Psychology, revised edition, 1929, p. 170. The other citations from Woodworth refer to this work.

observed facts, in these general forms: without X, Y will not occur; and the occurrence of Y is more *probable* after $X + m$ than after $X + n$.

But, with the ideal of the physical sciences before us, we have deceived ourselves by formulating laws that seem to predict consequences in the same way that physical sciences predict the pitch of a string, the reaction of two substances on each other, or the shape of leaf that will grow from a seed. Laws of learning thus stated are, in fact, useless for prediction; and they are definitely confusing and harmful; because, in order to make more plausible such laws of necessary consequence, psychologists have drawn up certain physiological pictures, *each of which lends itself to some theory of learning that excludes all others. Hence the present 'confusion and violent disagreement.'*

For example, Woodworth, to show that learning may be the necessary consequence of concurrence and repetition of acts, works out very carefully (pp. 170 and 543–546) a physiological theory of activities draining into or being absorbed by dominant activities. This theory would reduce all learning to the general pattern of the conditioned response. What is well learned is 'smooth, easy and often only half-conscious' in its operation. Learning, then, is habit formation (p. 176). On the other hand, Wheeler[4] pictures beneath the surface behavior of the organism, in all acts of learning a configuration of physiological stresses or tensions which *of necessity* resolve themselves into the resultant action, in accordance with the physical 'principle of least action.' From *this* standpoint *all* learning is 'an extension of insight' (p. 240); and extension of insight is very different from the formation of 'half-conscious' habits.

That these two views of learning are mutually exclusive and incompatible is roundly asserted by Wheeler in these words: "It might be argued that the rat displays a low degree of insight which appears in certain situations in the maze, but that for the most part his learning is 'stamped in.' *But it is*

[4] R. H. Wheeler, The science of psychology, 1929, pp. 80, 81. The citations from Wheeler all refer to this work.

inconceivable that two sets of principles, based upon logically opposite and incompatible assumptions, should be applicable to his behavior" (italics his, p. 266). The imcompatible *assumptions* are (1) that learning is a matter of forming connections between responses (Thorndike, Woodworth, etc.); and (2) that learning is a matter of configuration and insight. The latter denies the possibility of explaining the whole by its parts (p. 16); while the former purports to explain the whole by its parts. The incompatible *conclusions* are that learning is altogether extended insight, and that learning is altogether habit formation.

But, if we avoid the underlying assumptions of a physiological picture, which are introduced to support an appearance of necessary consequence, then nothing compels us to assert that all learning is *either* insight extended *or* habits formed. *In many acts of learning both obviously occur together without conflict or confusion.*

The third law English cites is that of Redintegration. "When a component part of any act occurs it tends to reinstate or bring back with it all other components which have formed with it a unified whole." Here again the word 'tends' suggests a universal, necessary consequence; but the facts observed merely tell us that often some 'other components' are reinstated, though always some of them are not. That often they *are* reinstated is the factual basis of Hamilton's law of 'Redintegration,' to the effect that any such component is *capable* of reinstating the whole—a statement that is unproved and worthless for prediction. That always some components are *not* reinstated gives Hollingworth [5] his law of 'Redintegration,' to the effect that a part acts for the whole. In both cases the actual predictive value is found when the law is stated in the form of *necessary antecedence*: Hamilton would then remind us that meaningfulness and information depend on certain prior acts of synthesis and insight; while Hollingworth's law suggests what prior events are necessary, wherever cues operate in skills and in psychotic behavior. The prediction then takes the form: without X no Y; with X, Y becomes possible.

[5] H. L. Hollingworth, Psychology; its facts and principles, 1928, p. 198.

In this brief essay these few illustrations must serve to indicate the path of reflection which leads me to the judgment that confusion and conflict in the psychology of learning spring from the attempt to support by physiological pictures and by the ambiguous word 'tendency' laws of necessary consequence in learning. I shall now argue that we reach unity and harmony in the study of learning, in the first place, by confining our laws to the forms which observed facts support: viz., *universal* laws of necessary antecedence and sine qua non's, and *statistical* statements that point to economy in learning: in the second place, by recognizing wherein the concrete acts of learning consist, and by seeing how all observed *modes* of learning are for the purposes of empirical study abstracted from such concrete *acts* of learning.

To illustrate I select the illuminating biography of Gene Stratton (Porter) as summarized by Woodworth in his revised text (pp. 11*ff*.). I quote the description of a single episode, composed of a sequence of acts of learning. "She early came into conflict with the teacher, who had written on the blackboard the sentence, 'Little birds in their nests agree,' and was pointing out the good example set by the birds, when Gene, from her intimate knowledge of bird households, interrupted, 'Oh, but they don't agree.' . . . She got the punishment to be expected. Soon, however, she settled down to diligent school work, and became quite a master of making a finished recitation."

In this sequence of acts thus biographically portrayed we observe that Gene, already widely learned in the ways of living things, so transforms herself and the world about her that her school room becomes not a scene of humiliation but the theater for exercising her nascent powers of composing, uttering, communicating. *This remaking of oneself in a sequence of decisions is learning in the fullest, the fundamental sense.* But, from such episodes and acts of learning in the concrete, psychologists have found it useful to abstract four modes of learning for special study. These correspond to the four 'theories of learning' which Bode well describes; and which for the sake of brevity may be called habituation, information, self-regulation, and 'intelligence.'

In the episode of learning that I have chosen for illustration all these four modes of learning take place in close association. For little Gene clearly (1) in settling down to the conditions of school life, has learned a certain routine of 'half conscious *habit*'; and (2) she has also 'extended her insight,' becoming so *informed* that with intensified and extended awareness she delights in the part she plays in the classroom circle; and (3) doubtless she has formed certain 'ideals' of purpose and achievement by which to improve and *regulate* her processes of thinking; and (4) she has become more 'intelligent' and with the lapse of time, through a general process of maturing in that specific type of human environment which her biography describes, has attained a new level of understanding.

I shall presently indicate how different schools of psychology have emphasized one or other of these four modes of learning; but let us pause to consider what work has been done in the study of learning in that fifth sense to which I have referred, which is fundamental to all others. Gene learned a great lesson in the sense that *she and the school-world about her came to a new settlement, opening up new paths of response and new channels of activity. By a sequence of choices and decisions the child 'makes up her mind' anew; she remakes herself and becomes for herself and in the world a causative factor very different from the child with which the episode began.*[6] Learning as it occurs in persons is in some measure always of this nature; and our ultimate and real concern is with such complete concrete acts and episodes and histories of learning.

It is learning in this fundamental sense that we study in case-histories of deranged or criminal persons, in biographies of children and of distinguished persons, in autobiographies, and in such comparative studies of genius as Binet[7] and Catherine Cox[8] have furnished. Here we have not found,

[6] I give a fuller account of the five phases of human life here described, in the *J. Phil.*, 1927, 24, 85–95, 113–120, 148–153; and in, An introduction to psychology, 1926. (2nd ed. 1928. Published privately.)

[7] Alfred Binet, La psychologie des auteurs dramatiques, *Rev. phil.*, 1894, 37, pp. 60–118.

[8] C. Cox, Genetic studies of genius, Stanford Univ. Press, 1926, Vol. II.

and do not expect to find, laws of necessary consequence that will fully warrant the prediction, this child N. will become a scholar, a pervert, a successful executive, the inmate of an almshouse, or any other specific type of person. But we do find that *without* a certain level of intelligence, *without* certain sensory equipment, *without* intense specific interests in childhood, *without* a certain social tradition and organization, musical genius, e.g., will not occur; or again, that *without* certain peculiarities in childhood certain psychoses will not appear. Specific factors also make more probable specific consequences in the life-career of individuals. It is largely in the hope of extending these empirical laws of necessary antecedence and of probable consequence, in life-histories of learning, that psychologists abstract from such lives the four modes of learning I have named.

The first subsidiary mode of learning, that of habituation, we abstract when we ask the practical question, What specific routine of movement and posture and speech will best serve little Gene in her new social milieu, and how can she most surely and most economically acquire that unconscious or 'half-conscious' routine of habits. We then analyse the desired routine in terms of responses that should recur to situations that will recur. From acts of choice and decision these responses are gradually dissociated, largely through repetition, until they approach automatism. Observation and laboratory experiments assist us in discovering what procedure, with the greatest economy, makes this habituation possible and probable. Obviously this automatization depends upon the *continuity* of physiological processes, in contrast with the *discontinuity* that marks acts of insight and choice. Some 'canalization' must take place in the coördinating mechanism of the body, and persist. But since the complexity of learning includes so much more than this process of habituation, learning is not so governed by physiological mechanism that we can predict the necessary consequences of whatever procedure we adopt in learning. Current descriptions of learning in exclusively physiological terms are, as I have shown, the result of disregarding this limitation.

From learning in its fundamental character of self-adjustment we abstract also a second mode, which I have called *information*. We abstract this mode in answer to such questions as *what pattern of perception and knowledge* must Gene attain to realize the part she may play in that school room? And by what steps of *instruction* may she proceed from outbursts of protest or enthusiasm to cheerfully telling what she knows, through the medium of ordered and adequate recitation. Such instruction, whether by self-instruction, or through the agency of other persons or of things, is a mode of learning; but is not the whole of it. Those who study methods of instruction stress *discontinuity* of acts of attentive activity in insights and decisions. They speak of ideas and lessons learned, and of a sequence of patterns of information which form a curriculum of study. Learning here is not a question of getting habits, but of insight extended and newly organized, in relation to a goal that is *imagined*, not present and observed. In this mode of learning, also, laws have been empirically ascertained, telling what sequence of insights makes possible and probable, but never inevitable, the understanding and perception that is desired. Such laws of necessary antecedence and probable consequence call for no theory of mind or body, and suggest no exclusive theory of learning. Certain habits and certain information both are necessary to any given personal adjustment and to 'making up one's mind' to a given course. But that adjustment is by no means complete unless a third mode of learning appear.

Therefore, from that transformation of the individual which is learning proper, psychologists abstract also this third mode of learning, in answer to such questions as these: what *ideals* of attending, perceiving, reflecting, and inventing must Gene hold up and hold to, if she is to meet adequately the ever changing problems of that school room? Alertness, absorption in the present task, self-control, foresight, system, confidence, self-criticism,—such ideals are formulated factually by a mere definition of the processes of 'thinking.' That these general attitudes or standards are not definable as habits is generally recognized; nor are they patterns of information

in a sequence of instruction. Usually psychologists discuss 'thinking' apart from learning; but the processes that bear that name play a part in most episodes of learning. This improvement of thinking, this *self-regulation* and *self-discipline* of thinking, is a third mode of learning, and, together with habituation and information, is essential to complete learning.

Without such 'ideals' of self-regulation and discipline the chief goals of learning are not obtained; and such learning is made more probable, it seems, by one formulation of those ideals than by another. There is a marked tendency, however, to assume that with such improvement of thinking,—with the 'liberation of intelligence'—adequate adjustment is assured and true education achieved. It is indeed to support such a tendency in theories of learning that Bode advances his theory of 'mind';[9] just as other exclusive theories of learning have sought support in other theories of mind and body.

The last of these abstract modes of learning is easiest to measure but hardest to define. Its meaning and importance is recognized when we see how much Woodworth's narrative would gain if we were told what stage of physical and mental maturity Gene had then attained. If her 'mental' age then was seven, the episode would bear an aspect quite different than if her general level of '*intelligence*' were that of the average ten-year-old child. To disregard this mode of learning is characteristic of those who are absorbed either in imparting information or in automatizing habits, or in regulating thought; while those who are concerned with eugenics or with the superiority of some type of culture, exaggerate the importance of this general educational development, apart from specific habits, from information and from ideals of good thinking.

This 'intelligence,' or general educational development of a person in a given type of environment, has been so measured that we can state with some precision the 'minimum' which makes possible a given achievement by the individual; and

[9] B. H. Bode, Conflicting psychologies of learning. Education is concerned 'with the cultivation of thinking' (p. 274): with the 'liberation of intelligence' (p. 295.)

the 'maximum' beyond which 'intelligence' makes no difference with regard to that achievement; while between these 'critical scores,' achievement varies with success in the test. But we have no right to assume that from a given level of 'intelligence' at a given age there follows a certain rate of intellectual growth, as surely as the growth of an acorn gives us in due time a certain kind of leaf. Those who think in terms of necessary consequence in this field of learning are called 'educational determinists'; and they have their theories of mind and body to furnish a support that the facts of learning refuse.

So a single harmonious psychology of learning results when, without any philosophical theory about the nature of mind or body, we in this way relate to each other the five types of empirical study now carried on with regard to personal learning.[10] These five types of inquiry are related by showing that four of them are attempts to answer as many distinct questions about learning, thereby revealing four abstracted modes of learning; while the fifth deals with acts and episodes of learning in the life-history of learning in persons, where these modes all appear concretely together. I do not question that other phases of learning will be isolated some day by specific experimental techniques. In the first part of this paper I have tried to show why this unification of the psychology of learning has not been brought about before.

It may be asked why it is that in physics we obtain universal laws of necessary consequence and *not* of necessary antecedence; while in psychology the opposite is true? In biology it seems that universal laws of both sorts are, in some respects, attained; while in sociology, I find neither. In sociology laws are statistical—not, it seems, universal; and statistical laws are found not only in sociology and psychology, but in all science. Are these differences matters of degree; or, as I believe, of kind? The problem demands separate and full treatment.[11] Here it is enough to note the present state

[10] Studies of animal learning are pretty well confined to studies of 'habituation' and 'information' (insight). Köhler's 'Mentality of apes' suggests a curriculum of 16 successive insights, for promising young apes.

[11] P. Hughes, Forms of generalization and their causes, *J. Phil.*, 1930, **27**, 281-287.

of empirical inquiry in the psychology of learning. If we avoid the unwarranted assumption that laws of learning are and *must* be laws of the same form that laws in physics assume, the way is opened to a program of coöperative and harmonious research in the study of learning, along some such lines as I have indicated.

[MS. received December 14, 1929]

DISCUSSION

EXTINCTION AND NEGATIVE ADAPTATION

To Mr. Winsor's[1] note on the above topic there may perhaps be added the following considerations. Pavlov gives the following properties of the 'extinction' of the conditioned response: (*a*) the extinction may be removed by extraneous stimuli, which may be either of an originally 'neutral' character, as far as their effect on the primary response is concerned, as *e.g.* 'some small disturbance produced by the audience,' or they may be biologically adequate to produce response in the effector under consideration, as *e.g.* weak acid placed in the animal's mouth; (*b*) the extinction will disappear after an interval of time; (*c*) the extinction may proceed beyond the zero point. It is possible to produce these phenomena in connection with negative adaptation or 'habituation.' In a paper now in the press and to be published in the *Psychologische Forschung* the writer has described dehabituation in the land snail by a stimulus causing intense reaction of the same type as that which had disappeared from habituation; he has also produced this result in experiments on other forms of life.[2] The phenomenon may be elicited in a human being by clapping the hands at intervals of two or three seconds behind the subject's back until the wink reflex has disappeared, and then dealing him a sharp blow on the shoulder, which will ordinarily call out a pronounced wink, after which the clap of the hands will again elicit the reflex. Holmes reports dehabituation in the sea urchin,[3] Ada Yerkes a parallel phenomenon in Hydroides Dianthus.[4] On several occasions, further, habituation, almost effected on a turtle, in the writer's laboratory, was disturbed by a relatively slight stimulus within or without the room. We made no specific study of the effects of these slight stimuli, but the fact seems to be beyond question. They parallel Pavlov's observations

[1] A. L. Winsor, Experimental extinction and negative adaptation, PSYCHOL. REV., 1930, 37, 174–178.

[2] G. Humphrey, Le Chatelier's rule and the problem of habituation and dehabituation in Helix Albolabris, *Psychol. Forsch.*, 1930, 13. (In press.)

[3] S. J. Holmes, Phototaxis in the sea urchin, *J. Animal Behav.*, 1912, 2, 126–136.

[4] A. Yerkes, Modifiability of behaviour in Hydroides Dianthus, *J. Comp. Neur. & Psychol.*, 1906, 16.

on the extinction of the conditioned response. It is, further, common knowledge that responses which have disappeared from habituation may reappear with time. This has been observed for example by the writer in land snails. Piéron [5] has devoted a monograph to a special treatment of this phase of the problem. Again, habituation may proceed 'beyond the zero point.' It is possible, for example, to recognize a stage where habituation is established but where a standard rest of say 30″ will restore the response. If stimulation is now continued, the zero point ultimately comes where such a rest no longer restores the response. Similar results have been observed on frogs by the writer and his colleague, Dr. Melvin.

If therefore we were in possession of the data on either of these phenomena of 'extinction' or 'negative adaptation' [6] without the other, we should have to postulate some kind of physiological state or process which checks action, which may be removed by appropriate stimulation and by lapse of time, and which may be intensified by appropriate repetition to a point past that necessary to prevent action. Now it is of course possible that there are two distinct physiological states with such properties; but is such a hypothesis necessary? It seems to the writer more reasonable to conclude that, in view of these strong similarities, the theory that two different mechanisms are involved is not justified in the present stage of knowledge.

It does not, however, necessarily follow that extinction is due solely to the effects of repetition of the secondary stimulus. Two things seem to be happening when a conditioned response is being extinguished. The secondary stimulus is being repeated, which may well cause a phenomenon parallel to negative adaptation; but also food is *not* being given, which latter fact might well be expected to interfere with the functioning of whatever neural structure has been built up by the simultaneous presentation of, let us say, bell and food. That is to say, in addition to the effect of repetition of the secondary stimulus, we may have to do with a temporary overlaying of the associatory neural structure, making extinction a double process. Kleitman and Crisler [7] seem to have found evi-

[5] H. Piéron, Recherches expérimentales sur les phénomènes de mémoire, *Année Psychol.*, 1913, 19, 91–193.

[6] To be specific, extinction in dogs, negative adaptation in land snails.

[7] N. Kleitman and G. Crisler, A quantitative study of a conditioned salivary reflex, *Amer. J. Physiol.*, 1927, 79.

dence for the existence of some such double process. Thus while both phenomena, extinction and negative adaptation, probably have the same underlying physiological mechanism, yet the possibility should be kept in mind that extinction may be of a distinctly more complex nature than negative adaptation.

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NOTE ON 'THE ANALOGY BETWEEN MENTAL IMAGES AND SPARKS'

The analogies suggested in my article which appeared in the May issue of this REVIEW (pp. 214–227) may be amplified by the following addition to number V.

V.Z. Others, notably Spearman and Coué, deprecate trying harder. But the Coué-Baudouin 'law of reversed effort' may be compared with the tendency of a high potential to cause sparks in wrong places, where the insulation is weak. For the 'reversed' effect is a thought or action from which the patient wishes to escape; that is to say, one which he has recently experienced; and this recency has left that synapse with enough residual conductance for the 'reversed' discharge to begin. (C. Spearman, The abilities of man, New York, Macmillan, 1927, p. 334; C. Baudouin, Suggestion and autosuggestion, London, Allen & Unwin, 1922, pp. 121–127.)

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